RAILROAD GAZETTE

FRIDAY, SEPTEMBER 18, 1903.

CONTENTS

Contributions

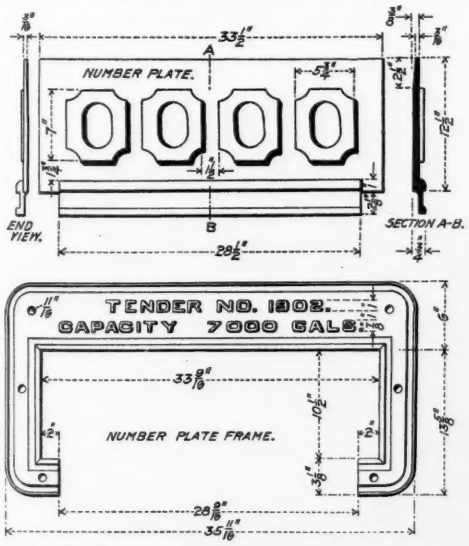
A Suggestion for Marking Tenders.

Williamsport, Pa., Sept. 2, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

As it seems to be an established fact that the engine and tender should have separate numbers, and that both should appear on the rear of the tender, and realizing the confusion caused by, and the additional expense in maintaining, an "extra" tender, to say nothing of not being able to keep a perfect record of the cost of repairs and mileage of wheels under each tender, the thought occurred to me which is portrayed in the accompanying drawing.

The idea is to use a cast-iron frame with the individual



Number Plate and Frame for Marking Tenders.

tender number and capacity in gallons cast on the same in rather subdued letters, say 1 in. or ⅞ in., as shown; this frame to be provided for the tender when being built (on new work) the same as any other casting, and riveted in place on the back end near the top. The engine number would be cast on a separate plate which is removable without any labor. It is suggested that cast-iron be used for the reason that the whole arrangement can be made without any machine work. Also it does not require the service of an artist or high-priced man to paint the letters, and will ultimately be cheaper than painting. Of course, where the additional expense does not matter, it would be attractive to have the passenger engine number plates made of brass, with the face of the letters ground, polished and lacquered; while in freight service a cast-iron plate, with face of letters ground and gilded or painted with aluminum paint would be more suitable.

By the use of a device of this kind there would be saved the bother and expense of maintaining an extra tender in all engine houses. It would compel a uniformity of standards for tenders in the way of connections between engines and tenders, as the idea is to have any engine that comes to the shop with tender for repairs to take the first tender that is fit for service, it being only a question of changing the engine number. Or, in other words, when the engineman brings his tender to the shop for repairs, he removes the number plate from the frame and puts it in his engine cab until a tender is assigned to him, when he or the fireman places it in the frame.

A. P. SHARP,
Chief Draftsman, M. P. Dept., P. R. R.

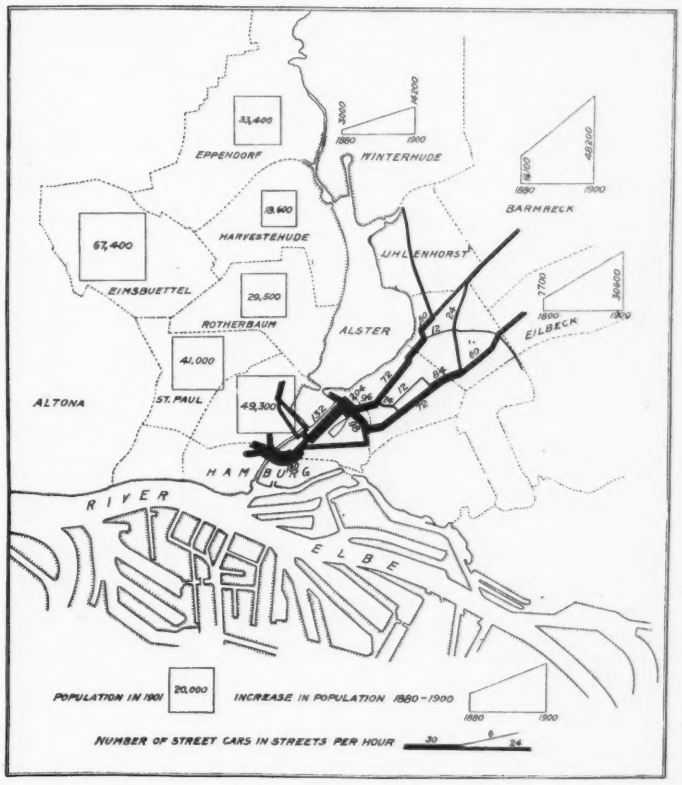
Proposed Monorail Suspended Railroad For Hamburg.

TO THE EDITOR OF THE RAILROAD GAZETTE:

One of the propositions for a rapid transit system in Hamburg, Germany, is the monorail suspended railway system and is treated in a paper, read last April, before the Architects' and Engineers' Society in Hamburg by Mr. Richard Petersen, Chief Engineer of the Continental Electric Co. of Nuremberg. This report is interesting, treating thoroughly the local conditions and rapid transit problems in general, and is illustrated with many maps, plans, diagrams and views of the existing monorail suspended railroad in Elberfeld and also of the proposed one for Hamburg. The report gives a full history of the rapid transit problem for Hamburg, describing the different alignments, etc. This is of only local interest, but I wish to describe his treatment of rapid transit problems in general, which he illustrates with many diagrams.

The centers of population of the different districts are shown by square blocks, drawn to scale and inserted on the map. Another map shows the increase in population of the different districts. The street car travel in the streets per hour is indicated, in number of cars per hour, by the thickness of the lines. Other diagrams show the increase in population and traffic of different cities, traffic per head of population, traffic at certain hours and exchange at junction points.

These diagrams afford an excellent means of illustrating at a glance and I append a sample. It shows how a map can be utilized for quick information as to traffic increases and decreases.

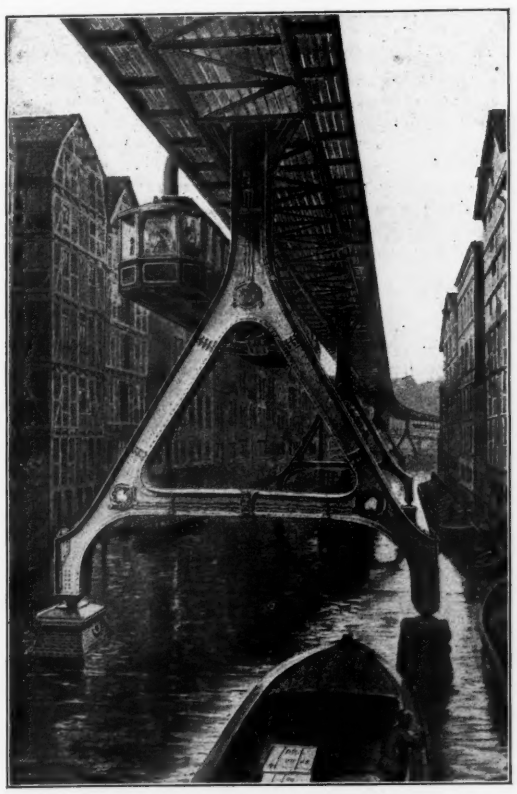


Distribution of Population in Hamburg, Germany.

Of interest is a comparative statement of population and traffic increases in 20 years in Hamburg, Berlin, and New York.

	Population. 1880.	Population. 1899.	Increase in 20 years.
Hamburg	409,000	683,600	167 per cent.
Berlin	1,123,700	1,846,200	164 "
New York	1,848,700	3,278,000	177 "

	Traffic. Street and Elevated R. R. 1880.	Traffic. Street and Elevated R. R. 1889.	Increase in 20 years.
Hamburg	16,140,700	85,844,300	532 per cent.
Berlin	62,619,000	414,682,400	662 "
New York	288,000,000	986,000,000	342 "



One Form of Suspended Railroad Proposed for Hamburg, Germany.

If in this statement the population and the traffic of Hamburg in 1880 is assumed as 100 the proportion in 20 years of Hamburg, Berlin and New York appear as follows:

	Population. 1880.	Population. 1899.	Traffic. 1880.	Traffic. 1899.
Hamburg	100	167	100	532
Berlin	275	450	387	2,560
New York	450	800	1,780	6,100

This shows the great superiority of New York in traffic in relation to population. In 1899 New York had eight times the population of Hamburg in 1880, and a traffic of 61 times that of Hamburg in 1880. In 1899 New York had 4.8 times the population of Hamburg in 1899, and its traffic was 11.5 times that of Hamburg in 1899; that is, the New York people travel 2½ times as much as those of Hamburg.

The power proposed for this system is electricity. The calculations are for a train interval of 2½ minutes on the main lines and 5 minutes on the branches, the trains to be protected by electric block signals. The stations are designed to have three platforms, the center one for exit from trains and the two outer ones for entering the cars. The designs for the stations show elaborate architecture, as is generally the custom in Germany. The report shows many different views of the structure through streets and canals and several of the proposed stations.

The report discusses in detail the merits of the monorail suspended railroad system. One of its main features is that it permits a very short radius of curvature and therefore gives this system great advantage in getting around corners of narrow streets. Curves of 125 ft. radius will pass trains at 30 miles per hour. Other features of this system are: The smooth riding of the cars, the lighter cars, and therefore lighter structure, the little obstruction of light in the streets, and the easier maintenance of track. The first cost and the operation is also expected to be considerably less than on an ordinary elevated railroad. This system is in successful operation between Elberfeld and Barmen, Germany.

The rapid transit proposition in Hamburg is still open, and according to former proposals received the city seems to be willing to make valuable concessions to the right party, and there is a good proposition for financiers.

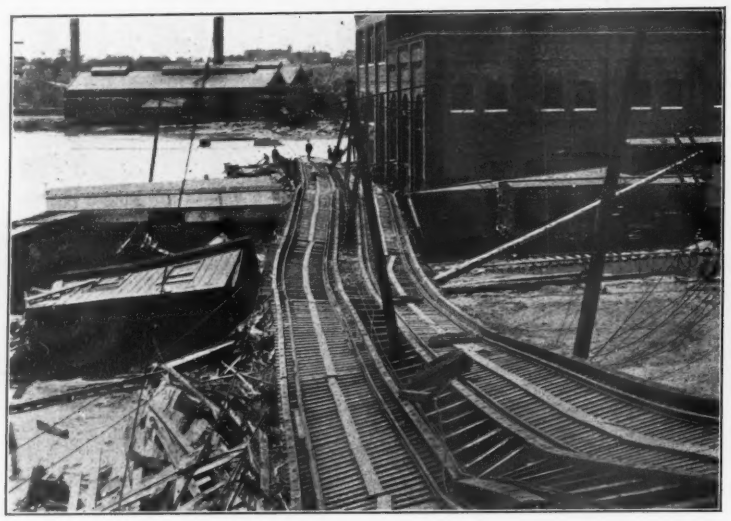
G. E. LEMMERICH.

Water Treatment in Railroad Operation.*

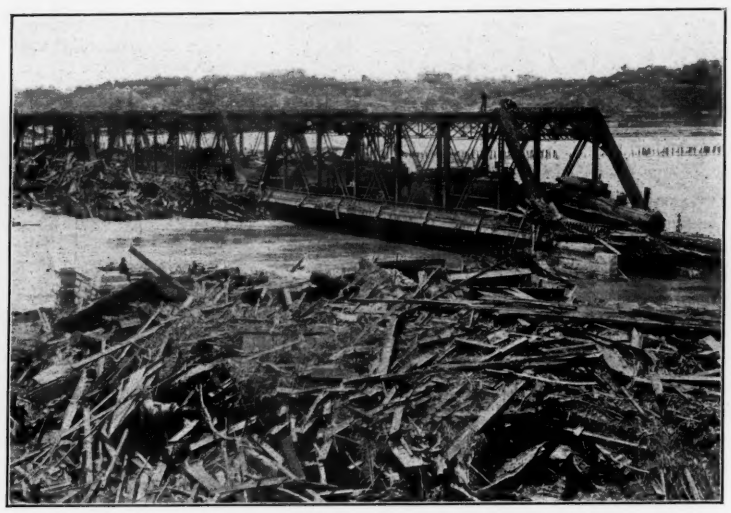
A western road covered a stretch of 250 miles in a bad water district by treating-tanks placed so that the passenger engines would use only treated water, the stations being 50-miles apart. The freights, taking water more frequently, were not expected to show the same benefit as the passenger engines. In the course of a few months the passenger power showed by inspection that the old scale was dropping off the fire-box sheets and staybolts and that the treatment was becoming effective.

As a rule boiler waters are found objectionable if they contain ingredients that will cause corrosion, incrustation or foaming. Corrosive matter can generally be neutralized, but foaming troubles are difficult to overcome. Oil, tannic acid, liquid hemlock and various boiler compounds have been experimented with, and perhaps the best results have been obtained with the Omaha boiler compound, which seems to quiet the water very effectively without injuring the boiler. If a water contains over 50 grains

*Extracts from a paper by Mr. G. R. Henderson, presented to the Western Railway Club, Sept. 15, 1903.



Metropolitan Street Railway "L" Road at East End of Central Avenue Bridge.



Missouri Pacific Bridge During Flood.

of foaming matter (soluble salts) to the gallon, it is sure to give trouble in a locomotive.

The incrusting salts must be regarded as of two kinds: carbonates and sulphates. The former, when boiled, give off carbonic acid gas when in excess, and deposit as chalk in a soft, flocculent mass, easily blown out of the boiler. By a previous treatment of slaked lime, the carbonic acid is all combined with lime, allowing the carbonates to deposit while cold in the treating tank instead of in the boiler. In such cases all the carbonates originally in the water, and that which is formed from the added lime, will be deposited by gravity, if the treating solution be of the proper strength, and neither the carbonates nor the treating lime will enter the boiler.

With sulphates, however, the conditions are different. These require soda ash or soda carbonate for their reduction, the reaction producing carbonates and soda sulphate. The carbonates will be deposited, as explained before, but the soda sulphate remains in the solution, enters the boiler, and constitutes a foaming grievance. It does not form scale, but by concentration makes the water so light that it primes and passes over into the cylinders, and at times even prevents blowing the whistle.

One large western road is following the practice of leaving waters untreated if they contain 50 grains of foaming matter per gallon after treatment. A water may contain 30 grains incrusting and a like quantity of foaming matter to the gallon; the treating of such water (if the incrustants be sulphates) would result in over 60 grains of foaming material, and the road says that foaming water causes leaks.

Baryta hydrates has been suggested as a means of preventing foaming, by forming baryta sulphate, which is insoluble and will precipitate, but its expense is prohibitive. Ordinary treatment of lime and soda ash can be made for from 2 to 6 cents per thousand gallons for chemicals. It seems as if the only way in which foaming can be obliterated is by distillation. The cost of this method has generally been considered beyond reason, but by means of an apparatus devised by our fellow-member, Professor Goss, distilled water may be produced for 13 cents a thousand gallons, figuring coal at $1 per ton. In localities where it is necessary to haul water any distance, say 50 miles or more, the still may show a very nice saving, and the cost of the apparatus will not, perhaps, exceed that of the equipment tied up in water service. A model of such an apparatus has been tried on water containing 400 grains per gallon, and has demonstrated its practicability.

It would be well to have each water thoroughly studied to find out whether, after treatment, it will be all that is desired. These suggestions are not intended in any way as a reflection upon the treatment of waters, as we believe that railroads must come to recognize it as good practice, but it is intended as a caution to those who expect a speedy relief from all boiler troubles, without taking the necessary steps to prevent simply a correlation of trouble.

The Kansas City Floods.

Messrs. Waddell & Hedrick, consulting engineers at Kansas City, have furnished us the following review of the damage done to bridges in that locality by the destructive floods last spring. Only a brief notice of the flood damage was printed in the *Railroad Gazette* at the time, as it seemed advisable to wait until the wreckage could be cleared away and a comparison made of the strengths of different types of bridge construction, with proper allowance for the conditions to which each was subjected.

Waiting Room, Union Depot.

For several days during the latter part of May heavy rains fell in the central Missouri valley, extending over almost the entire area of Kansas, Missouri and Nebraska. All of the large streams were much higher than usual, but no serious damage was done to property in the Missouri or Kaw river valleys.

On Friday, the 29th of May, the Kaw river began to rise rapidly, and by Saturday evening the water came up on the streets in Armourdale and that portion of Kansas City, Kansas, located in the Kaw river bottoms. The river continued to rise throughout the night, and on Sunday morning the water had almost crossed the bottoms and was within a short distance of the Union depot. It then became evident that if the river continued to rise great damage would be done. All traffic on the surface street car lines was stopped. The river continued to rise all day Sunday. Many buildings in the low lands were picked up and carried away by the current. The surface of the river was covered with all kinds of floating debris.

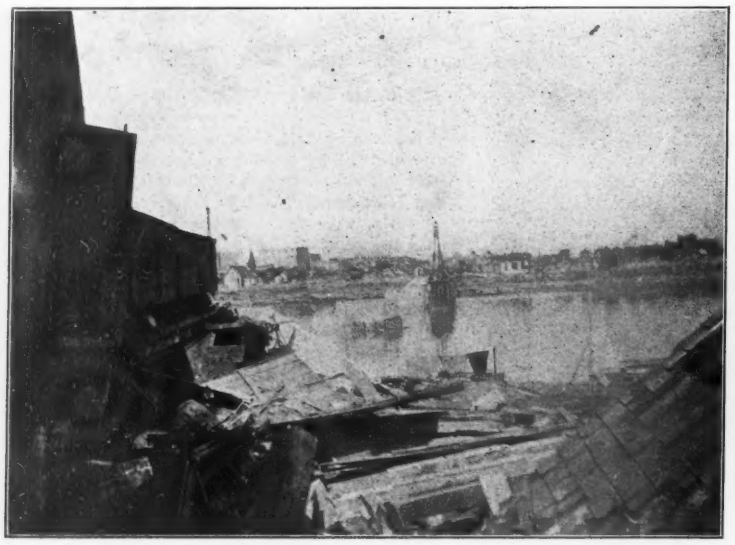
By four o'clock in the afternoon the river had risen to the level of the roadways on most of the bridges, and in many cases was flowing over them. All railroad structures were loaded down with cars or engines. By six o'clock the water was in some cases flowing over the tops of flat cars standing on the bridges. The drift had accumulated above the bridges in enormous quantities, and they were under almost breaking strains to withstand it. It required only a small additional force to destroy them. Finally a large oil tank floated into the current and was carried against the already tottering structures.

There were 16 bridges carried away within two hours time between Argentine and the mouth of the Kaw, a distance of only four miles. Only one bridge across the Kaw river near Kansas City remained, that of the Missiouri Pacific, a very heavy double track structure, which was loaded from end to end with locomotives.

Beginning at the mouth of the Kaw river the following is a list and partial description of the bridges destroyed or damaged:

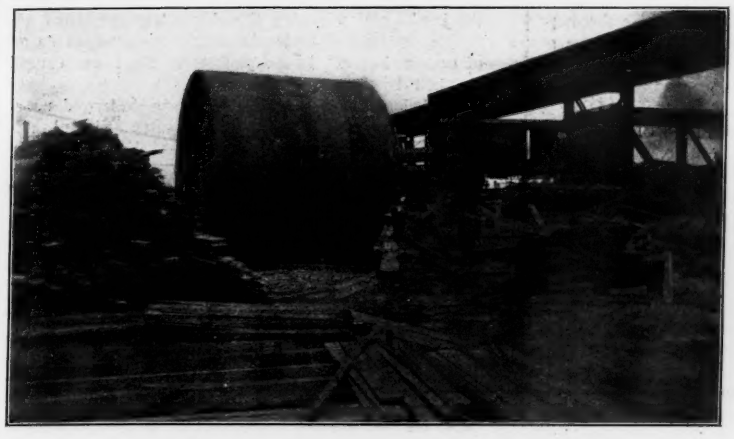
1. The Wyandotte & Northwestern railroad bridge. Three combination wood and iron spans of about 200 ft. each, resting on steel cylinder piers. The entire superstructure was destroyed, and the channel piers were overturned. The cost of repairing this structure will be about $180,000.

2. Flow Line bridge. This structure carried the water supply for Kansas City, Mo., and a portion of Kansas City, Kansas, over the Kaw river. The superstructure consisted of two steel spans of 185 ft. and 226 ft., respectively. These spans rested on masonry abutments and one central cylinder pier. The 185 ft. span was destroyed and the 226 ft. span badly injured. None of the foundations were injured. As a result of the destruction of this bridge the entire city was without water for 12 days. The power houses of the Street Railroad company, the Electric Light company, and the Gas company were all shut down because of lack of water. Thus for a period of 12 days Kansas City, Mo., had no



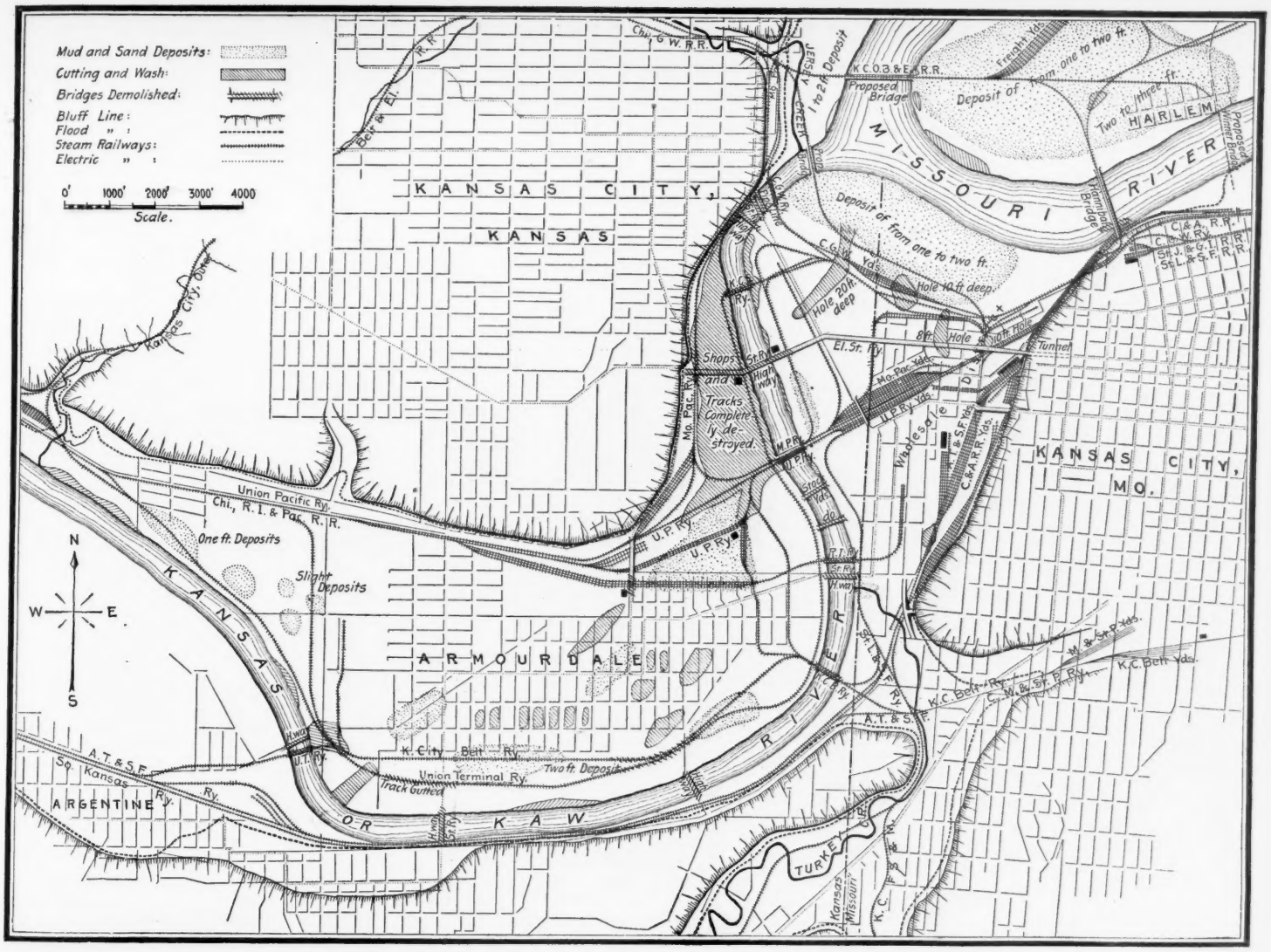
Kansas City Suburban Belt Railroad Bridge.

Flow Line Bridge, Which Carried the Water Supply.

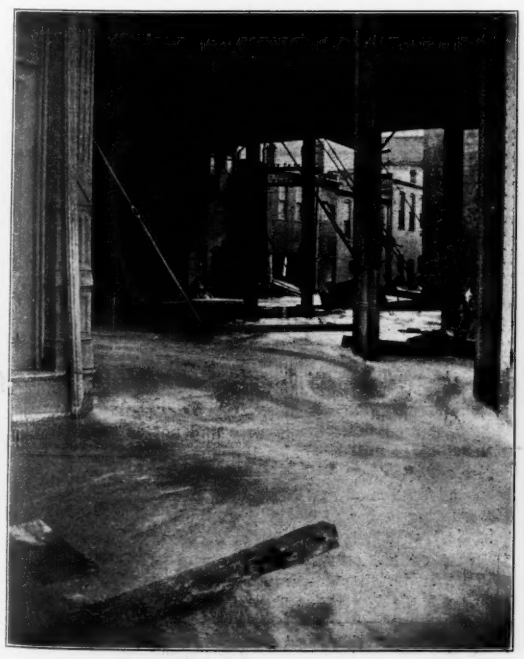


Swift's Oil Tank, Which Acted as a Battering Ram.

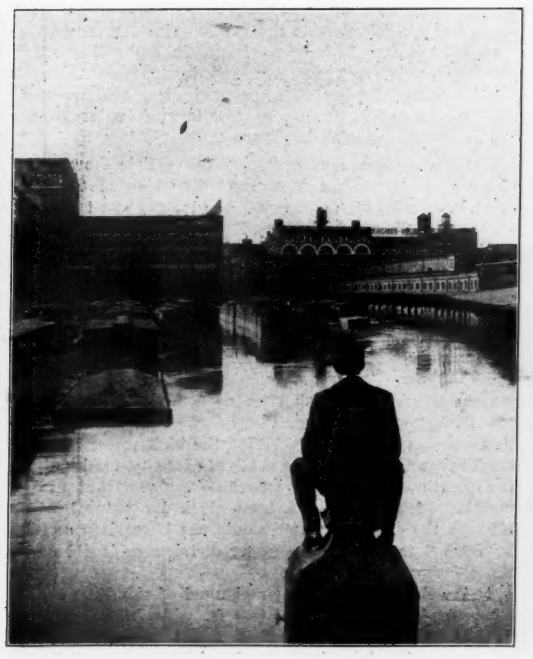
Chicago & Great Western Bridge—East Span.



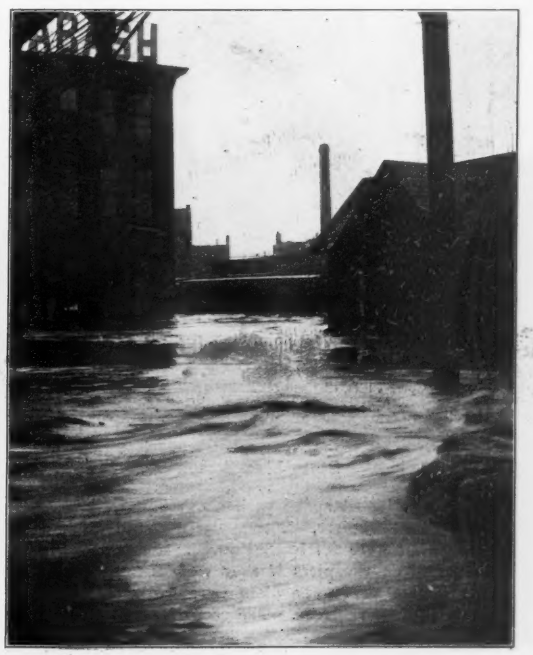
Map Showing Flooded Area in Kansas City and Railroad Bridges.



Torrent Breaking Through Buildings on Union Avenue.



Freight Yards and Implement Warehouses.



Rapids in the Wholesale District.

water, no street car service and no electric or gas lights, and all on account of the destruction of one 185 ft. span. The loss to the city by the destruction of this bridge cannot be estimated.

3. Metropolitan Street Railway bridge at James street. This consisted of three steel spans of 170 ft. each, and one of 120 ft.—all resting on masonry piers. The three river spans and the two channel piers were destroyed. The cost of replacement will be about $150,000.

4. James street highway bridge. This was made up of two 240 ft. steel spans resting on one masonry pier and two masonry abutments. Both spans and one abutment were destroyed. This structure will be rebuilt in connection with the Metropolitan Street Railway bridge, and its cost is included with that bridge.

5. Kansas City Southern bridge at Ohio avenue. Three steel spans of 197 ft. each, resting on concrete piers. The spans were all lifted from the piers and carried down stream from 350 ft. to 700 ft. They are new and of the riveted type, and are apparently in almost as good condition as when completed. The piers were not damaged. The spans will be replaced on the piers without cutting them apart. The cost of repairing this structure will be about $45,000.

6. Combined Highway and Electric railroad bridge at Central avenue. Three 198 ft. pin-connected steel spans, resting on masonry piers. The spans were double decked. The lower deck carried a highway 20 ft. wide and a 7 ft. sidewalk; the upper deck, two street railroad tracks. The three spans and two of the piers were destroyed. Some of the metal will be recovered and used in the new structure. Approaching this bridge was an elevated railroad structure, about 600 ft. of which was torn down. The cost of rebuilding will be about $100,000.

7. Missouri Pacific bridge. Three double track steel spans of about 200 ft. each, resting on masonry piers. These spans were uninjured. The reason that the spans stood is presumably because the structure is a very heavy one, designed for modern loads, and is double tracked, giving it great lateral stability; it was not struck by the heavy oil tank which played such havoc with the bridges farther down stream; the current at this point in the river was largely diverted to another channel, and the bridge was loaded down with heavy locomotives for several weeks. This bridge furnished the railroads the only means of crossing the Kaw river.

8. Union Pacific bridge. Three double track pin-connected steel spans, resting on masonry piers and abutments. The spans were all destroyed but the piers were not badly damaged. This bridge was rather old and of light design. The cost of rebuilding will be about $200,000.

9. Stock Yards Company's bridge. Three riveted steel spans resting on masonry piers. The spans were all torn down but they were not badly damaged and the greater portion of the metal will be used in the new structure. The piers were badly damaged, as they were built of a very soft sandstone. The cost of replacing this bridge will be about $60,000.

10. Upper Stock Yards bridge. Three light pin-connected steel spans about 200 ft. long, two masonry piers and two masonry abutments. The spans were all totally destroyed. The cost of rebuilding will be about $40,000.

11. Chicago, Rock Island & Pacific bridge. Three

State Line Street.

single-track riveted spans each about 200 ft. long, resting on masonry piers. The spans were all taken from the piers but were not badly injured. These spans might be replaced on the piers if they were heavy enough for the present traffic. The piers were badly damaged and will have to be replaced. The cost of rebuilding will be about $120,000.

12. Kansas avenue highway and electric railroad bridge. This structure provided for a 20 ft. roadway, a sidewalk and two street railroad tracks. The three spans, each about 200 ft. long, were of the combination wood and iron type. They were all entirely destroyed. The piers were not badly damaged and may be used in the new structure. Cost of rebuilding about $75,000.

13. Kansas City Belt Railroad bridge. Three single-track combination wood and iron spans, resting on masonry piers. The spans were all destroyed, but the piers were not damaged. The cost of a new superstructure for this bridge will be about $80,000.

14. Fifth street highway bridge. A light highway bridge. The spans were of steel and of the pin-connected type. They were all destroyed. The piers and abutments are all in good condition. Spans were knocked down by driftwood. Cost of rebuilding, about $35,000.

15. Twelfth street bridge. A combined highway and electric railway bridge. The spans were of steel and of the pin-connected type. All spans but one destroyed. Piers of masonry. Two end piers and the east abutment in good condition, the two middle piers considerably damaged, and the west abutment destroyed. Spans were thrown down by floating debris. Cost of rebuilding, about $45,000.

16. Kansas City Southern bridge in Argentine. A single-track railroad bridge of four pin-connected steel spans resting on steel cylinder piers. The spans were all knocked down except the west one. The piers are all standing, but one of the channel piers is slightly out of position. Some of the old spans are in fairly good condition and a portion of the metal might be used again. The spans fell when struck by the highway bridge just above. The cost of replacement will be about $100,000.

17. Old Southern bridge. The structure was a highway bridge, and was perhaps the oldest bridge over the Kaw river near Kansas City. There were four spans resting on masonry piers. The spans were all destroyed. The piers were not badly damaged, and can be repaired. The cost of rebuilding will be about $45,000. The spans went down from being struck by floating houses and heavy drift.

The total cost of rebuilding all of the bridges over the Kaw destroyed by the flood will be from $1,250,000 to $1,500,000. A study of the condition of the various wrecked structures shows very conclusively the greater durability of solid riveted spans when compared with those of the pin-connected type. Of the 16 bridges, three were riveted structures, viz.: the Kansas City Southern bridge at Ohio avenue, the Stock Yards Company's lower bridge, and the Chicago, Rock Island & Pacific bridge. All of these structures were knocked down, but in all three cases the spans are but little damaged, and may be used again. Not much of the metal in the pin-connected spans is worth recovering.

The only set of solid concrete piers in the river were those of the Kansas City Southern bridge at Ohio street. These piers were located near the mouth of the river where they were struck by all the heavy debris, but they were practically uninjured.

To guard against a future disaster of this kind, all new bridges over the Kaw should be raised high enough to clear the recent high water level by from 8 to 10 ft. The spans should be made longer, so that not more than one pier would be placed in the channel. By combining two or more bridges into one and making these combined bridges very wide and heavy, and with very rigid lateral bracing there would be very much less liability to failure. Further, it is believed that concrete piers of proper dimensions will withstand without injury any such floods.

The actual damage done to the bridges represents only a portion of the loss the cities suffered from their destruction, as the loss from the lack of transportation facilities has no doubt been equally great. The railroad terminals are nearly all located in the river bottoms and some of the principal freight yards were practically destroyed. The handling of freight has been and still is a very difficult matter. The loss to the various railroad companies from damage done to their tracks, yards, and rolling stock has been enormous, and the total loss within the two Kansas Cities in buildings, merchandise, bridges, railroad improvements, industries and loss of business, etc., has no doubt exceeded $10,000,000.

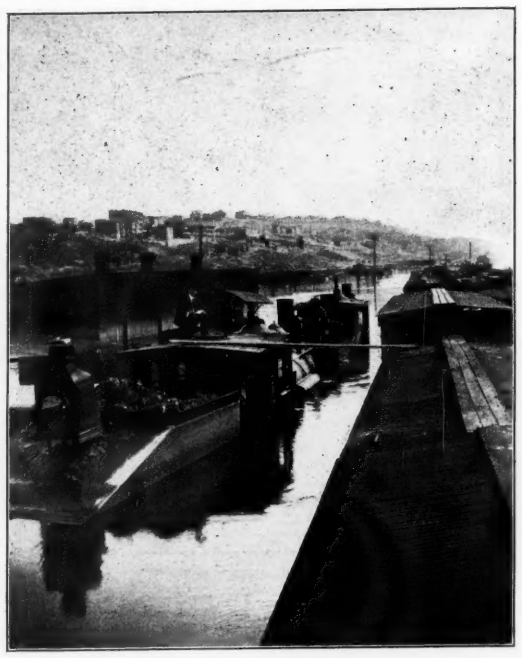
The photographs accompanying this article show views of some of the bridges destroyed. The view of the Missouri Pacific bridge conveys an idea of the great amount of drift which the bridges had to withstand. As it remained standing, the drift was deposited above it, amounting to several million feet of lumber.

The Kaw river near the mouth has been gradually encroached upon for years, the abutting property owners filling in and reclaiming the land for industrial purposes. The normal width of the river from bank to bank is about 800 ft. At the James street bridge, just above the mouth, this channel had been narrowed down to about 450 ft. between abutments. The effect of this contraction was shown by the fact that the high water mark at the Turkey Creek pumping station, about two miles above the mouth of the river, was 10 ft. above that at the mouth. If the river had been given its natural width through the city, the water would not have risen so high by from 6 to 8 ft. in the upper districts as it did under the existing conditions.

It is evident that the clear channel of the Kaw should be made from 800 ft. to 1,000 ft. wide from Argentine to the Missouri river, and it would be practicable to protect the low-lying lands in the cities against all future floods by building about 11 miles of strong levees along the banks and widening the channel as suggested above.

The property damages in such a case would be great, of course, but not in comparison to the losses caused by the last flood.

No bridges over the Missouri were destroyed near the city, but the approaches to the Chicago, Milwaukee & St.



Switch Engines in Difficulty.*

Paul bridge at Randolph, five miles below, and of the Atchison, Topeka & Santa Fe bridge at Sibley, 27 miles below Kansas City, were both partially washed out.

Care and Handling of the Compound Locomotive.†

The compound locomotive and the men who care for and handle the machine, have been severely criticized for a great many things that should be charged to the designer or builder, or the conditions under which we have been laboring. Heavy power and four-cylinder compounds are comparatively of recent origin. They came to us during a period of prosperity, and railroad companies have been compelled, because of heavy business, to put their engines in "the pool," and in doing so it has been trying on the compounds, because they were new.

Railroad companies have in some cases changed power on an entire division from simple engines, weighing 75 tons, to compounds weighing 150 tons. These conditions have been the cause of the compound locomotive being charged with a great many things for which it is not at fault. The compound feature of the engine has, however, brought to the surface some structural defects or weaknesses that we would not have found with simple cylinders. Before the men whose duty it is to care for and handle the machine can get good results they must first have an engine designed and built for the service expected.

Assuming that we have a locomotive capable of hauling 2,000 tons at a speed of 20 m.p.h. over a division with a maximum grade of 26 ft. per mile, we should load the engine to the maximum tonnage, taking care not to overload so that it will be necessary to "simple" the engine. To get good results from a compound we will have to load it to the maximum tonnage, or nearly so. An engine designed to handle a train of 15 heavy passenger cars at a speed of 50 m.p.h. will not show economy with a six-car train when run at 60 m.p.h. The same is true of an engine designed to haul 2,000 tons over a level road at 20 m.p.h., when it is loaded at one-half the tonnage and run 40 m.p.h. In other words, the compound locomotive must be designed and built for the service expected, and if an engine is capable of pulling 2,000 tons on a level division at 20 m.p.h. it should be kept in this service, as you will not get good results otherwise. A simple engine will handle half its rating more economically than the compound.

The reverse-lever should always be in full stroke when starting a compound as well as a simple engine, and the starting valve should always be open. This not only assists in starting the train, but helps to warm up the low-pressure cylinders in cold weather, and with the Vauclain engine equalizes the pressure on both pistons.

The starting valve is what its name would imply. It should be used for that purpose and not as an auxiliary with which to pull excessive tonnage. The fact that this device adds to the tractive force of the locomotive is often taken advantage of and the engine is over-loaded, causing the starting valve to be used and the engine to be run "simple," which is hard on any compound. The compound must not only have the support of the enginemen and mechanical department, but the train should be kept at, or a little less than, the maximum tonnage, as these

*Pictures showing flood scenes, other than bridges, are from photographs by Underwood & Underwood.

†Abstract of a paper before the Traveling Engineers' Convention, by A. L. Beardsley, Atchison, Topeka & Santa Fe.

locomotives are not made to run with the starting valve open, and we soon lose the economical feature by using this device as an aid to pull tonnage.

It has been said that Vauclain compounds do better without the starting valve, and in some cases I understand it has been taken off. This, I think, is a mistake. The abuse of the starting valve is in using it at a speed of from 4 to 15 m.p.h. with a wide-open throttle. There is no question as to the necessity of this device, and in my opinion there is no damage done to the locomotive by it when properly used; in fact, I think there is more harm done in starting the engine without it than when it is used. The reverse-lever, as before stated, should always be in full stroke and the start made with as little throttle opening as possible. If this is watched there is no harm done by the use of this valve. As soon as the engine is fairly started the valve should be closed and kept closed until the throttle is again shut off. It should be opened immediately after the throttle is closed.

The compound will do better work if a little steam is worked going down hills, merely enough to keep the relief valves closed. This is not only better on the engine, but will help to keep the low-pressure cylinders hot and will assist in lubricating the cylinders. In starting the train, and while it is being pulled over the road, we should be careful not to let the engine slip any more than is absolutely necessary, as the four-cylinder compounds will wear their tires faster than a simple engine, owing to the fact that they will slip six revolutions where a simple engine will slip four, because the power that starts the engine to slipping has to pass through two cylinders instead of one, and after an engine starts to slip it requires but little crank effort to keep the wheels turning. This not only wears the tires fast, but is hard on a compound because of the weight of the reciprocating parts. For the same reason they will probably wear the main driving brasses faster than a simple engine. The fact that the crank effort is more uniform on a compound than on a simple engine should, however, offset the wear on main driving brasses, caused by weight of reciprocating parts when the engine is slipping.

A compound will start a heavy train on a grade with little or no jar, owing to the fact that steam to the low-pressure cylinder passes through the starting valve. It requires some little time for the steam to pass through the valve and fill the different cavities; this fact should be considered and should not be too big a hurry in starting. Give the engine a little time.

As the train gets into motion the reverse-lever should be hooked up a notch at a time until the engine can handle the train at the speed desired. If the engine is laboring too hard when working at one-half stroke, the throttle opening should first be regulated, then no harm will be done by hooking the reverse-lever up in a shorter cut-off; say, to a 12-in. cut-off for a 28-in. stroke. The size of the valve affects this somewhat, and the man running the engine should be the judge as to where it does its work best. Locomotive manufacturers are now turning out engines with a blocked quadrant, so that they cannot be worked in less than one-half stroke when new. As the engine wears the effect is the same as lengthening the reach-rod or cut-off, and we soon have an engine working from 2 in. to 4 in. more steam than was intended in the first notch, and it is either necessary to maintain a nearly uniform cut-off or go without a blocked quadrant. As there are no bad effects from working a compound in less than one-half stroke, if conditions justify it and it is properly done, I do not recommend a blocked quadrant. The large valve we now have in some compound locomotives allows us to work them shorter than one-half stroke and you will find them more economical in fuel and water. They will do good work with no bad results to the engine. This, of course, is governed by the grade they are on and the speed.

There is no question but that the economical point to work a compound locomotive is in one-half stroke, or a little more; but we often find times in the service when this is not practical. The engineman should find out for himself where the engine will do its work best and cheapest by trying it with different cut-offs and throttle openings. The throttle opening demands his attention at all times.

As the train is being pulled over the road we may discover that the engine is lame and I often hear it said by men who are well posted that it is easy to detect what is wrong or where the blow is with a compound. I do not agree with them. I find it difficult to distinguish the difference in blows, as there are several different defects about a Vauclain compound that will have the same effect on the valve motion or sound of the exhaust. Practically the same is true of the tandem engine. Therefore the engineer must be careful not to mistake two light exhausts on the right side for two heavy exhausts on the left side, and vice versa.

In testing for blows it is unsatisfactory to go by the cylinder cocks. I recommend removing the indicator plugs on the side of cylinders, or the water relief valves on cylinder heads. Some roads are putting indicator plugs in all cylinders. This is an improvement, not only as a help in locating blows, but to assist in lubricating when it is necessary to tow the engine in. If the locomotive is disabled and has to be towed in, there will be no bad effects if you remove all the indicator plugs and the plugs over the valves and lubricate valves and cylinders well. This is quite an advantage, as it would be a hard matter to take down the main rods on the large engines. Some roads now instruct their enginemen not to take down the main rods in cases of this kind. It would be much easier to remove cylinder heads, and I find from experience that it is not necessary to take down main rods. The engineer, being on the ground, should, however, use good judgment in handling his engine and must be held responsible for its condition. If the engineer is careful in watching the engine work while pulling a train over the road, and makes a standing test on completing the trip, he will generally find what is wrong; but there are so many different blows that have the same effect that the engineer is often criticized for not reporting the work correctly, when he is not at fault. The machinist who does the work should look for loose bushings, etc. This can generally be detected by tapping the bushings over the bridges with a light hammer. He should also look for cracked bridges and cylinders.

Not only the engineer, but also the different men who care for the compound should be familiar with the engine. I have known of cases where the foreman criticized an engineer for not reporting defects right when he himself could not assist the engineer in locating the trouble.

I believe in a periodical inspection of packing rings in a compound locomotive, and from what information I can get in regard to this I think it should be done every three or four months. When this inspection is made, the bushings, bridges, etc., should be thoroughly inspected, the bushings to see that they are tight, and the bridges for cracks. Recently I have found valves with sand holes in the castings, which, of course, had the same effect as broken rings in valves. We also find cracked bridges between the different ports, which do not show on the outside. These cracks are hard to find on account of the bridges in the valve bushings.

It is hard on any locomotive, and particularly so with the compound, to work damp steam or water through the cylinders; and this point should not only be watched closely by the engineer, but the boiler should be kept clean and have plenty of steam room, as there is no question that the piston valve will carry water over quicker than a plain D valve; and on account of the mild exhaust with the compound locomotive it is rather hard to detect. For this reason more attention should be paid to cylinder cocks on the compound.

Some engines have 12 cylinder cocks connected to one lever, which opens and closes from the cab. This is quite a strain to be thrown on the one lever, and it should be made so that it works easily and all cocks respond readily when opened. I also find cylinder cocks on a 28-in. low-pressure cylinder with only a $^{3}/_{16}$-in. opening to let the water out. We have much better results with a cylinder cock having a $^{5}/_{8}$-in. opening. Condensation must be got rid of as quickly as possible, and the cylinder cocks on compound locomotives have not had the attention they should have had. It takes little, if any, more oil to lubricate the cylinders of a compound than it does a simple locomotive. The oil should, however, be fed regularly and steam should be worked in the cylinders at all times possible in order to distribute the oil properly.

A compound on a grade does extra good work, and I find that they will pull even more tonnage than a simple engine of the same class, and in a test recently made it was demonstrated to my satisfaction that a Vauclain compound with cylinders 15½ in. and 26 in. x 28 in. would pull 100 tons more than a simple engine, up a grade of 42 ft. per mile, both engines having the same tractive force. The more uniform crank effort of these engines and the probable difference in the crank effort, I think, is in favor of the compound. They will pull trains with defects that would disable a simple locomotive. This fact alone is responsible for some of the criticisms we hear against compounds for the reason that in some cases they have been kept going until it was absolutely necessary to take the engine out of service. If the engine had been given the attention that is due any locomotive the probabilities are that it would not have been necessary to take it out of service. If we expect results we must care for our locomotives, and particularly the compound, because it is new to us and little defects are continually showing themselves.

The compound is said to be more expensive in repairs than the simple engine. While I have no data at hand to show this, from my experience the boiler repairs on a compound are less. The repairs to machinery are more, owing to the fact that we have two extra cylinders and valves, and the fact that the design and build of the locomotive are new, and that in some cases no facilities for handling the compound feature are provided. As the saving in fuel is from 20 to 35 per cent. in favor of the compound, the railroad company can afford to spend a few dollars extra on repairs. The fact that we have broken packing rings, leaky cylinder heads, steam leaks, etc., is not chargeable to the compound feature. The nozzle is an important part, and I have often known of its being reduced in size when the engine was reported not steaming, without locating the actual trouble; or of bushing the nozzle instead of grinding the steam-pipe joints.

With some makes of the compound you have had steam leaks around the front end of the engine so numerous that you could not detect where they came from and which one was the worst. This steam came from high and low-pressure pistons, valve stems, cylinder heads, cylinder cocks, relief valves, cylinder-cock pipes, etc., and did not have a tendency to make the engineer and fireman friendly to the compound. At least part of this trouble is chargeable to the design and work done at the locomotive works, as they came direct from the different works in this condition. The repairs on these large compounds have been made difficult and laborious from the fact that the facilities for doing the work are in some cases limited and the roundhouses are inadequate.

In conclusion I wish to add a few "don'ts."

Don't carry too much water.
Don't work too much throttle.
Don't fail to keep guides tight.
Don't fail to keep guides closed.
Don't let engine slip.
Don't fail to open the starting valve when you close the throttle.
Don't fail to close it shortly after starting.
Don't fail to have the reverse-lever in full stroke before starting.
Don't fail to open the cylinder cocks.
Don't set out packing rings with the peen of a hammer.
Don't fail to examine valves, bushings, cylinders, etc.
Don't fail to keep pistons in line when closing guides.
Don't jump at conclusions after a blow or the engine going lame.
Don't bush the nozzle every time the engine is reported not steaming. Perhaps the engineer or fireman is at fault.
Don't blame everything that happens to the compound. The large engine and the compound features are coming together and if the compound is properly treated it will show a saving in fuel.

The Combined Straight-Air and Automatic Engine and Tender Brake.*

With the advent of the modern powerful freight engine a new condition in train braking arises, a condition heretofore comparatively unknown, viz.: stopping long trains without breaking in two. If the brake is held on until the train comes to a full stop, this danger is eliminated, but the trouble is in enforcing the rule governing this feature. A close personal check of the causes of break-in-twos where long trains are handled with heavy power showed that 78 per cent. were due to releasing at slow speeds.

On our division of less than 120 miles the usual number of break-in-twos monthly run from 40 to 48, or an average of 44 per month. Seventy-eight per cent. of this equals 34.32. Of these about 20 per cent. were broken couplers, requiring renewal. About 45 per cent. were broken knuckles, the remainder being due to other causes. The cost for renewal of these broken couplers and knuckles, less "credits," would equal $84.56 monthly or $1,014.72 annually. But the cost of labor and material for break-in-twos is but a small proportion of the actual cost. When the cost of detentions and train delays and frequent damage either to equipment or to lading on account of trains parting and running together are considered we can readily see the necessity for some device that will aid in checking this evil. The last Car Foremen's Association report gives us a cause of trains parting: "Release of brakes at slow speed without proper resistance on the engine or head-end cars." Among the recommendations made to overcome this evil is the following:

"We would recommend that all engines in road service be equipped with straight-air; or if this does not meet with the approval of the officials, it would be nesessary for the superintendent to issue bulletins to trainmen requiring that where slow-downs are made, where the speed is not to exceed 8 m.p.h., that the train be brought to a full stop, or have the trainmen set up about six retainers on the head end of the train or set at least from four to six hand brakes. The application of straight-air on the locomotive, however, is the best method of overcoming break-in-twos from this cause."

With the increase in locomotive power, the train length has increased proportionately, and as the brakes release on the head end first the increased train length allows the full release on the head end of the train while the rear brakes are still set. This causes the surge and damage when brakes are released at slow speeds.

Another new phase in railroading due entirely to increased power and the demand for quick movement is the increase in size and power of yard and switch engines. The larger types of freight engines hauling such immense trains into the yards required a proportionate increase in capacity of yard engines to handle these trains. This necessitated a more efficient brake to handle these trains expeditiously, as with the present or automatic brake it was soon noticed that the repeated heavy reductions required gave insufficient time for recharging, thus reducing the holding power of the brake and causing the engineer to put more dependence in his reverse lever than in his driver brake, naturally resulting in a slower movement and greater damage, not only to his engine, but to equipment and lading as well. It was in the train yard that the first demand was made for a more flexible brake, and it was ably met in the new combined automatic and straight-air brake.

In order to ascertain the extent of its use at present and the success it has met with a list of questions was sent to members. Twelve roads reported having the device in use.

In regard to the cost of maintenance over the plain automatic brake, the replies from members having used the device for periods of from six to 18 months show that the cost for repairs as yet has been nil.

Other advantages not spoken of previously are as follows:

1. It quickens switching and reduces the incident damage to lading and equipment. It has been estimated

*Extracts from a paper before the Traveling Engineers' Association, by Frank P. Roesch, Chicago & Alton.

that the time saved by a yard engine equipped with this device over one equipped with the ordinary automatic brake, if expressed in dollars and cents equivalent to wages of crew, is about $1.25 per day. At this figure it would pay for itself in one month.

2. If the brakes are released on long trains, it prevents the slack from running out and the train from separating, especially at low speeds.

3. It prevents the slack of long trains from running in or out so suddenly, by reason of change of grade (sags or humps) or curvature, as to cause serious shocks and breaking in two.

4. It can be used to slow down or stop trains where the brake work required is not heavy, thus reducing pump labor, stuck brakes, wheel sliding and the breaking in two, incident to starting long trains with the brake-shoes dragging, or sometimes brakes stuck on cars toward the rear of train—a not uncommon result with automatic held on until the stop is made.

5. It prevents the slack from running out and aids the car retainers in controlling speed while descending heavy grades.

6. It holds the train and engine and enables the automatic brakes to be recharged when standing on grades, thus having the train brakes ready for immediate use at the start. It increases the safety when work requires that someone go under the engine, rendering it impossible for the engine brake to leak off. The latter prevents the possibility of the engine getting away when no one is present, even though the throttle leaks.

7. It enables control of speed while weighing cars.

8. It increases the mileage between tire turning, where tire-dressing shoes are used.

9. It decreases repairs to the automatic brake valve and the foundation rigging by reducing the use of the brake valve in emergency applications, something practiced by hostlers and yard enginemen everywhere.

The only disadvantage, if it can reasonably be classed as such, is that it requires additional parts. But these reduce rather than increase the labor and expense of engine brake maintenance, with one exception, that it requires more frequent adjustment of driver and tender-brake piston travel than with the automatic alone, due to the increased labor these brakes perform. To offset this, however, there is less reversing of the engine.

The double-check valve and straight-air valve are the only additions to standard brake parts. Several of these have been in use for nearly two years and many for shorter periods, yet no case has been reported where repairs have been required. The only parts liable to require renewal are the small leather seats.

Cutting's Disk Signal.

The Southern Pacific is putting up, in snowsheds at various places on its Sacramento Division, 30 disk signals, in which a single stationary lamp, with but one bull's-eye, is made to give two color indications; green for "proceed," and yellow for "caution" (or red for stop). This is accomplished by dividing the bull's-eye horizontally into two halves, and by providing shutters by which the halves may be alternately blinded. This signal is the invention of Mr. E. M. Cutting, one of the company's division foremen of signals, and a patent was issued to him on April 28 last. The patent specifications

Fig. 6.—Signal in Southern Pacific Snowshed.

say that Mr. Cutting has assigned one-half of his invention to W. W. Slater and H. C. Barnes. Mr. Slater is Signal Engineer of the Southern Pacific, and Mr. Barnes is also in the Signal Department. The appearance of the signal is shown in the photographic reproduction given herewith (Fig. 5), and its construction is shown in Figs. 1, 2, 3 and 4. Fig. 6 is a view in a snowshed, showing a signal indicating "all-clear."

This pattern of signal was devised after numerous unsatisfactory experiments with other disk signals. It was desired to produce a signal with the lightest possible movable parts, in order to work it by an electric motor of small capacity, and as the conditions in the snowsheds alternate irregularly between darkness and daylight it was desired to give both the go-ahead and the adverse indications for both conditions at all times and in as nearly uniform style as possible. The Southern Pacific uses green for the "go-ahead" indication, so that the absence of a colored glass or other translucent substance cannot be made to effect a night indication. In experimenting with strips of colored celluloid, Mr. Cutting discovered that a fairly good night indication could be given with one-half of the ordinary round disk, and he proceeded to devise a signal on the basis of this fact. At distances up to a mile, a light given by a half disk of colored glass is not distinguishable from a full disk. The red disk, as shown in Fig. 1, is of wood, 12 in. in diameter, and the inner circle, defining the small or glass disk, is 6½ in. in diameter. The blinders, *R* (red) for the upper half, and *V* (white) for the lower half, are both rigidly fixed to axis *D*, and turn together. When the upper half of the disk is covered (by *R*), the lower half is uncovered; when the lower half is covered

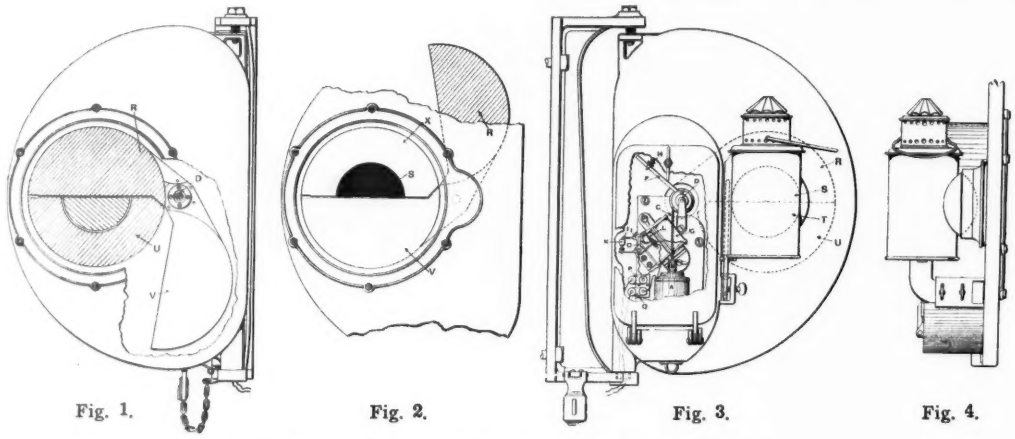


Fig. 1. Fig. 2. Fig. 3. Fig. 4.

Cutting's Disk Signal, Used in Southern Pacific Snowsheds.

In Figs. 1 and 2, R, red; V, white; S, green.

(by *V*), the upper half is uncovered. The upper half of the wooden disk, covered in Fig. 1 by *R*, and shown uncovered in Fig. 2, is painted white. The lower half is painted red, as shown in Fig. 1; in Fig. 2, this lower half is covered by the white blinder. For a distant signal or a switch signal, the use for which most of these signals have been made, the surface here shown in red is painted yellow. The blinders, when not over the disk, are at one side within the signal case.

Fig. 5.—Cutting's Disk Signal.

With this arrangement, it will be seen that when the red or yellow glass is exposed, showing a light of that color, the whole of the 12-in. disk is of the corresponding color. When the green glass is exposed, showing a light of that color, the whole of the 12-in. disk, except that part which is composed of the glass, is white.

The first experiments in working these signals were with electric motors, but later a solenoid was found sufficiently powerful, and was substituted for the motor. The manner of operation of the signal may be seen by reference to Fig. 7, in which *A* is the solenoid, *B* the plunger, *D* the sheave carrying the blinders, and *F* is an armature attached to *D* which, when it is brought down near to the ends of the cores of the magnet *G*, is used to hold the signal in the all-clear position. The blinders being thus held, power can be and is withdrawn from *A*. The signal can be operated by five cells of gravity battery, or one cell of storage battery. The power current flows from terminal *Q*, through *A* to the binding post on contact stop *L*, thence to contact tumbler *I*, through contact *J*, mercury cup *K*, frame *O*, terminal *P* and back to the battery. Current passing through solenoid *A*, pulls down *B* which, by means of its chain, turns *D* and changes the positions of the blinders or blades *R* and *V*. When screw *H* is brought down so as to strike the contact tumbler, it moves *J* and breaks contact at the mercury cup, thus opening the circuit through *A*, but there still remains a high resistance path through magnet *G*, holding the signal in the clear position until the current is entirely withdrawn.

One of these signals which has been in use at Oakland for two months, has been operated during that time about 60 times daily, and has worked for this length of time without failure by an 80-ampere-hour storage battery. The movement of the signal to the clear position takes a little over one second of time, and requires a current of 2.3 amperes, equal to about five watt seconds. To hold the signal in the clear position requires only .03 ampere.

As will be seen by Figs. 1 and 3, the signal is supported on an iron bracket in such a way that it can be swung around with its backside facing toward the track, making the interior easy of access. When the signal is in position for use, and locked in that position, the door to the case containing the mechanism cannot be opened.

The Railway Signaling Club.

The two meetings of the Railway Signaling Club, held in Chicago and New York, respectively, on September 8, were well attended by local members and profitable discussions were had on the apportionment of cost in maintaining and operating signals, the principal subject assigned for consideration. Twenty-seven new members were admitted to the association, 21 active and six associate. In both meetings the first business, after routine matters were disposed of, was informal reports from chairmen of committees. Mr. Anthony for the committee on automatic block signals, which was appointed to consider whether the home and the distant should be separate or a three-position signal should be used, reported that a considerable amount of information had been gathered and that the committee expected to make an interesting report at the November meeting. The committee had got so far as to vote not to recommend any change in the present practice of the majority of railroads. The three-position signal is, as yet, in such small minority, measured by the number of signals in use, that the committee could find no reason for recommending action by roads not using it.

Mr. Ames, for the committee on automatic stops, said that he expected to have a report ready for the November meeting. The several makers of automatic stops have informed the committee that they are still improving their devices.

Mr. Mock, for the committee on signal and track circuits, said that members had failed to send to the committee information which had been asked for. He desires

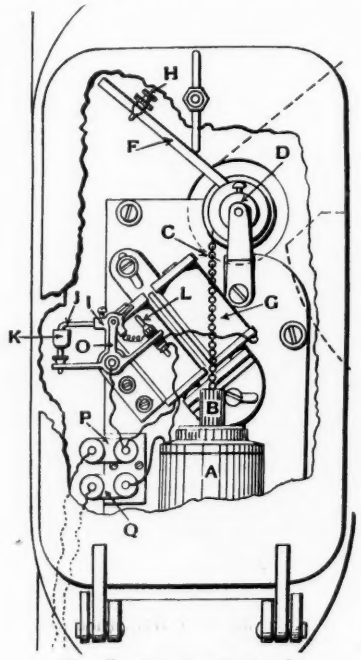


Fig. 7.—Details of Fig. 3.

copies of standard circuit plans for automatic signals with a view to making a report for the November meeting. Unless this information is sent, he fears that his report will not be sufficiently comprehensive.

The committee on cost of installing iron and copper wire for line circuits, Mr. Baliet, Chairman, and the committee on distant signals, Mr. Shaver, Chairman, are preparing reports for the November meeting.

CHICAGO MEETING.

At the Chicago meeting President H. C. Hope occupied the chair and announced that at the annual meeting of

the club, to be held at Detroit in November, he expected Mr. T. E. Clarke, General Superintendent of the Delaware, Lackawanna & Western, to be present and address the meeting. Vice-President J. C. Mock (M. C.), who lives in Detroit, will make the local arrangements for this meeting.

Classification of Signal Expenses.

The first thing in the discussion on the assigned topic (printed in the *Railroad Gazette* Aug. 28, page 622,) was the reading of letters from Mr. Christofferson (C. G. W.) and Mr. Shaver (U. P.).

Mr. Christofferson.—Maintenance certainly should be charged not only with wear and tear, but with renewals and everything required to keep up a plant. Decayed wooden parts and worn parts of a machine or leadout come under the head of maintenance. Lampmen are merely assistants to the signalmen; their pay must be charged to "Conducting Transportation." If such a man is also a repairman, his salary must be divided. Any change necessitated by moving crossover track, etc., should be charged to maintenance of signals. Renewals of batteries and the pay of men doing the work should be charged to maintenance; batteries, in my opinion, are part of the apparatus.

Going outside of these questions I would suggest another subject; the division of the cost of maintenance of joint plants. Where a change is made in a point interlocking, the apportionment of current expenses has to be revised. If the apportionment is made on the same basis as the apportionment of the original cost, a new statement of cost of plant must be made. In making changes in these plants, only that work and material which enlarge or improve the plant should be considered in making the new estimate of cost. Sometimes a change in an interlocking reduces the cost of maintenance as, for example, where a switch or a track is abandoned. The company thus reducing its demands on the plant should have its portion of the running expenses also reduced. To make a new basis of cost, the material taken out should be deducted at its original cost, including the cost of labor in putting it in. Where companies divide the expense on the basis of the number of levers, a change causes no trouble.

Mr. Shaver.—Mr. Shaver recommends the division of maintenance charges into ordinary and emergency, the latter to include things necessitated by changes in track, by derailments or collisions and by storms. The time of repairmen spent in attending to power generators or in cleaning up the premises should be charged to "C. T."; and when they make repairs necessitated by derailments, storms, etc., their time should be charged to emergency maintenance. Bonding of new rails should also be charged to this account.

Mr. Dunham (I. C.).—Why should the time of batterymen be charged to maintenance? Their work, like that of lampmen, is a part of the work of operation. Mr. Christofferson's suggestion about apportionment of cost at joint plants is timely. The points which he brings out should be provided for when the original joint contract is made. The most equitable basis of apportionment is, however, the lever basis. If in some cases this will not answer, the division can be made on the basis of functions.

Mr. Clausen (C., M. & St. P.), Mr. Peabody (C. & N. W.), and others expressed views similar to those of Mr. Dunham. It appears that contracts based on a percentage of the original cost are common in the West.

Mr. Christofferson (answering a question) explained that old material taken out and replaced by new could not very well be considered. In making the new apportionment, only the cost of the new could be considered; the company taking out the old could dispose of such material in any manner as it might see fit.

President Hope showed to the members copies of a revised classification of operating expenses recently adopted on the C., St. P., M. & O.

Mr. Mock (M. C.).—In making contracts for apportionment at joint plants each plant should be considered by itself. Many of the annoyances in this matter are due to lumping a number of plants together and jumping at a division without careful analysis of each case. Percentages based on the percentage of functions is undoubtedly the best plan.

Mr. Dunham.—On the Illinois Central bonding of new rails is charged to improvement of roadway, not to maintenance of signals. If a telegraph pole line is moved to make way for an improvement, such as a second main track, the expense is charged to the cost of the track. When a derailment occurs somebody is at fault, and the cost should be charged accordingly.

The question being asked whether, in the matter of automatic block signals, a charge should be made for deterioration and interest, one member answered that he estimated 10 per cent. for deterioration and 5 per cent. for interest.

After this discussion was finished, the members talked informally about back lights. Mr. Mock is using a 2-in. white light, but in some places has to use a blue bull's-eye or a plain ground glass. Sometimes an engineman is confused by a white back light. Back lights are needed which can be seen 3,500 ft., but blue is not equal to this; and white ground glass is hardly satisfactory. One member spoke of having had several narrow escapes from collisions on account of back lights being taken for signals. Electric indicators have been used in place of back lights, but these are, of course, very expensive. On the Chicago, Milwaukee & St. Paul, some of the back lights are blinded except when in the stop position; in the stop position they show blue. On the Michigan Central, some back lights have been used which show blue in the stop position, red in the intermediate and white in the clear position. Mr. Mock did not favor a blinder for a back light. On the Illinois Central there are some signals, with blue front lights, and others, on the same bridge, facing in the opposite direction, with purple back lights, an arrangement which had been found objectionable because of the similarity of these colors. Mr. Dunham thought that in automatic signals the back light might be entirely abandoned. At interlockings he would use a back light, his preference being for plain ground glass ¾ in. in diameter. Mr. Mock, who had back lights showing red intermediate, had put a shield in the place of the red so as to avoid stopping trains unnecessarily.

Mr. Boyce (C., St. P., M. & O.).—Adopt green for the clear night signal, then your troubles with back lights will disappear.

The use of signal lamps to burn many days continuously was briefly discussed.

President Hope (C., St. P., M. & O.) has been trying these with satisfaction. On the Lehigh Valley a large number of lamps are being used which burn four days. One member thought that no lamp would give a satisfactory light for seven days without attention, but another said that those who got only four days' service must be using the wrong kind of oil. With the right oil seven days' service is readily obtained. Mr. Peabody (C. & N. W.) has tried a number of different kinds of seven-day lamps, but was not satisfied with the amount of light. Mr. Mock has over 2,000 long-burning lamps in satisfactory use. To get a good light with a small flame the rays must be concentrated exactly to the right focus. With a broad flame much of the light is wasted.

NEW YORK MEETING.

At the New York meeting, the assigned topic, cost of maintaining signals, elicited but a moderate amount of discussion, as nearly or quite all of those present reported, both as to their practice and their opinions, in favor of the usual plan of charging to the maintenance account every expense incurred for the preservation of signals. On one road even the wages of the towermen are charged to the signal department, but this appears to be a very exceptional case. The principle of the dividing line between items to be charged to maintenance and those to be charged to "conducting transportation," or operation, was illustrated by the example of a switch lamp, of which the chimney and burner would be charged to maintenance while the oil and wick would be charged to operation. Answering the specific question about a charge for the bonding of new rails, a member said that while this would have to be charged to the maintenance of signals and could not rightfully be charged to maintenance of track, the signal engineer could, if necessary for the defence of his department, or to keep within an appropriation, make mention in his report of the fact that such and such sums had been incurred for purposes not strictly pertaining to signal work.

No member could think of any item in repairs to manual interlocking which ought to be charged to "conducting transportation."

An inquiry had recently been made as to the cost of maintenance of automatic block signals on a number of different roads, and the member who had made it said that he had found no two roads on which the practice in charging these items entirely agreed; and the net result of his inquiry was that as between roads no intelligent and accurate comparison could be made. Moreover, the reasons for the differences in practice are, in many cases, so trivial or are so hard to get explained that the inquirer had little hope of seeing any material progress made toward uniformity. In one case, the charges for labor were so minutely divided that the work of the trackmen in tamping ties at insulated joints was charged to maintenance of signals.

The necessity for making charges regularly for interest and depreciation was spoken of, but it did not appear that more than one road had an account of this kind.

The meeting finally voted that the questions under discussion ought to be referred to the committee appointed last November to consider what shall be entered as cost in making estimates. The chairman of this committee is Mr. H. M. Sperry, and the meeting directed him to have a report made covering the questions which had been discussed.

The meeting then resolved itself into a committee of the whole and discussed a number of topics. The first was the establishment of standard practice in the arrangement of wires and instruments of automatic signals. This has become an important matter. On the Delaware, Lackawanna & Western such standards were established two or three years ago, and the arrangement of instruments in the boxes, the location of the wires and binding posts, the tagging of the wires, and all the little details, are so uniform that a repairman or maintainer who has become thoroughly familiar with his own district is competent to do the same work in other districts. The Boston & Albany and the New York, Ontario & Western are working towards uniformity in these details. What, if any, differences exist between the standards of either of these three roads and either of the others, was not brought out.

Whether or not wires from the rails to a signal should be above or below ground was briefly discussed. An objection raised to the use of trunking, above ground, was that it was unsightly and that it would be disturbed by boys. On the other hand, to put wires below ground makes the discovery of faults far more difficult. Mr. Yocum, of the Reading, who had first put his wires underground, found on placing them above the surface that his force of repairmen could be greatly reduced.

Troubles from lightning were touched upon. One member had had six relays burnt out within a month, and had concluded that no arrester or fuse block was adequate to withstand atmospheric electricity in his territory.

The members interested in automatic signals having aired their "troubles," the chairman asked the mechanical interlocking men to present theirs. The only member responding was Mr. Anthony, who spoke of the difficulties encountered in trying to secure good service out of wire-connected distant signals. Assuming that other members were no more successful than himself, he propounded the question how many feet from the tower such a signal can be worked satisfactorily. Some signal engineers, said the speaker, take an "optimistic view," and say that their signals work 3,000 and 4,000 ft. without difficulty, but inquiry shows that this question hinges on the other question: What is satisfactory working? If a signal when "on" droops a bit and nobody mentions it; if the signal when pulled down does not go below 40 degrees, and if, with these conditions, nobody complains, the "optimist" regards the case as settled. Another question connected with this has to do with the basis of the optimistic view; is strict conformity to the rules regarding the position of the arm necessary, or is it a refinement which ought to be abolished?

Mr. Anthony has a few compensators on wire lines and finds that they work well where there are no turns requiring wheels and chains; but in wire lines which are not straight the compensator is far from satisfactory. For his own part, he had not been able to satisfactorily work a mechanical signal with a greater length of wire than 2,000 ft.

The question of standards having been brought up, it was voted, after some discussion, that the Secretary should be instructed to request, from the different roads represented in the Club, copies of their standard specifications for interlocking and block signals and their standard plans for the same, with a view to having these kept on file in the office of the Secretary, and with a view also to their consideration by the Committee on Standards, that committee to select at least six of the best or most representative standards to be reported on.

Painting and Maintaining Steel Cars.*

Steel cars are painted: First, to preserve the metal; second, to improve their general appearance; and third, to provide a background for marking. Many things cause destruction of steel cars, chief among which are corrosion, abuse, and accident. Paint will, in a measure, protect the metal from corrosion, but affords little protection from abuse, and none from accident. Therefore, we have to deal particularly with corrosion.

To prevent corrosion steel needs a protective covering which will keep the moisture containing oxygen and carbonic acid gas and the dilute acids from reaching the metal. This protective coating may be cement, enamel, paint, or varnish, and it will be effective as long as it adheres and remains impermeable. The condition of the metal surface when painted is, perhaps, more important than the mixture used for its preservation. Grease, oil and dirt can be taken off easily with benzine by ordinary methods, but for the removal of scale and rust cleaning by sand blast is the best process.

All parts which are not accessible in the finished car should be coated before being assembled. While the cars are being built, all joints, laps and seams, wherever metal is placed upon metal, should be filled with a mixture of the consistency of soft putty to make these parts acid and water proof. When the car is completed, all accessible parts of the underframing, body (both inside and outside) and trucks, should be properly cleaned and covered with a protective coating. The underframing and all parts of the body should receive at least three coats, except the parts of the inside which come in contact with the coal. These parts and the trucks should have at least two coats.

The use of the pneumatic machine is objectionable in painting because there is moisture in compressed air, which harms the steel; and it does not apply the coatings as evenly as the brush. It is an advantage to have a different color for each coating, when more than one is applied, to enable the workman and inspector to see that all parts are covered. After testing all the ordinary mixtures, and a great many others offered by manufacturers, we have failed to find a preservative coating which is entirely satisfactory for steel cars.

Maintenance.—After they have been coated properly cars are placed in service (most of them in the coal trade). The hopper cars are run to the mines where most of the inside coating is soon knocked off by the coal as it falls into the cars. Rain falling on the coal forms a dilute acid which acts on the metal wherever the coating has been knocked off. When the cars reach the coal piers they are pounded on the outside with bars and mauls in order to loosen the coal; and sometimes in cold weather a natural gas, or oil flame, is turned on them to thaw out the ice. Cars are sometimes loaded at steel mills with red hot material and the coating is quickly burned off.

To give the metal reasonable protection by the use of

*Abstract of a paper before the Master Painters' Association, by J. D. Wright, Baltimore & Ohio.

paints it will be necessary to repaint the outside parts and underframing about every three years, and the inside parts every year. The best coating that can be found should be used on the underframing and outside parts, the loose scale and corrosion being removed by the use of scrapers and steel wire brushes. It will, no doubt, pay to coat the inside parts occasionally, but it will not pay to spend much time on cleaning, or applying an expensive material. Tests recently made show that tar paints, when free from acids, are suitable for the interior of coal hopper cars.

To sum up the following suggestions are offered:

(1) Secure a well-cleaned surface at the contract shops before the first coating is applied.

(2) Coat all inaccessible parts before they are assembled, and fill all seams, laps and joints while the cars are being built.

(3) Make extensive comparative inspections on cars in actual service in order to test the merits of mixtures offered by different makers.

(4) Secure an even and careful application of the most suitable coating that can be found.

(5) Reduce the abuse of the cars in service as much as possible.

The Tie Problem and Concrete Ties.*

Excepting the improvement in the form, and increase in the weight of rail sections, we have made little real progress in the details of track construction in the past 45 years. We certainly maintain better track than in former years, but the same materials in the same essential form are still used.

The various kinds of timber that are naturally inferior or unfit for ties do not gain in value by treatment because these processes affect the fiber of the timber and reduce its strength. The life of the tie is prolonged at a corresponding increase in cost. The most serious feature of the whole problem—that of unequal settlement because of eccentric pressure—remains untouched by any plan or process so far proposed.

Metal ties, principally cast, have been used abroad for 50 years. It has been a continuous experiment, always coming short of success. Recently word has come that they are at last to be discarded altogether, and that the European lines are now substituting timber ties.

Not only is the question of cost of metal ties an objection, but such construction is too light; the ties get no hold in the ballast, and it is found impossible to keep the track in line. Weight and mass are, within certain limits, essential factors in all structures, and steel ties fail entirely in this respect. Another function that ties must fulfil that seems to be commonly overlooked in the consideration of new forms is that they must support derailed cars and engines until they are off the ends of the ties.

The construction of modern track has not kept pace with other improvements. Rails only have increased in weight, but as we have gained in section we have lost in quality. In the quantity or quality of ballast there has been little or no change. As to ties, the number to the rail length has rarely been increased, while in size and quality we have steadily lost for some years past. As to lack of skilled track labor in recent years, experience seems to be uniform. The principal lines hardly maintain their standards, while the cost per mile for roadbed and track labor is not going down. The ends of ties in a track are slightly depressed or are loose. Further examination shows that the ends of all the ties are loose in the bed, and the passage of a train shows a marked deflection of the ends of the ties, the centers bearing firmly. The track is "center-bound," but not from center tamping. All track rules and all good practice prohibit center tamping.

The ties extend about 18 in. outside of the center of the rails and about 30 in. inside, referring to each rail separately, as a center of pressure. The base of the tie presents more bearing surface inside of the rail than it does outside, and it must settle unequally. In other words the center of pressure and the center of figure of the bearing surface do not coincide. In other structures resting on an earth base such an adjustment would be condemned. Every pair of wheels depresses the ends of every tie, and a corresponding series of undulations is set up in the surface of the rails, so that each pair of wheels travels continually in the trough of a wave.

The base of the rails cuts into the ties, and this cutting action is greatest at the outer edge of the base of the rail, so that on straight and level track the rails have taken a permanent position with the vertical center lines of the sections inclined outward. This inclination will vary in amount but is always present in track that has been laid for any length of time. Measurements readily show it and it is frequently visible to the unaided eye. This cutting action is caused by the bending of the ties in their bed under the passage of trains. When tie plates are used the cutting action of the rail is eliminated while the inclined position of the rail under load continues. Broken rails are seldom, if ever, caused by vertical pressure, but are caused by the lateral stress developed with the rails in the inclined position. With our present form of track construction this is unavoidable.

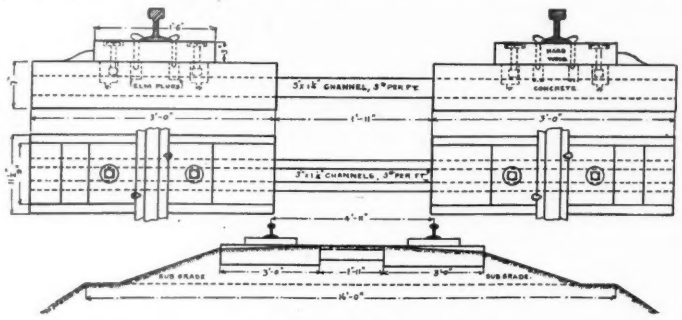
I have attempted to design a tie that should not only be permanent in character but one that will meet all objections referred to above. It is first assumed that the center of pressure, and the center of figure of the base of the tie must coincide. Second, existing forms should be adhered to as far as possible. Third, that concrete and steel are suitable materials, when properly proportioned and combined, with provision for distributing pressure and cushioning shocks.

This has been accomplished by making a two-part tie with the parts rigidly connected. In section the tie is the same as that of a "pole" tie 7 in. thick and 9 in. face. The center of the tie is cut away, or omitted, for a length of 1 ft. 11 in., so that there are two blocks of concrete of the 7 in. x 9-in. "pole" tie section, each 3 ft. long, centering under each rail. These blocks of concrete are moulded on the ends of a pair of 3-in. steel channels, 7 ft. 11 in. long, which are placed back to back and spaced 2 in. apart.

Hardwood blocks 3 in. thick by 9 in. wide and 18 in. long, secured to the top of the concrete blocks, serve as spiking blocks, cushion shocks, and distribute pressure. Each hardwood block is, of course, centered with reference to the line of the rail. Cast iron sockets that also serve to space and connect the channels are moulded in place in the concrete, and serve as an anchorage for holding down the hardwood blocks.

These sockets receive a suitable bolt, head down, so that when it is slipped to its place, and the opening through which it was introduced has been plugged, it cannot be withdrawn by ordinary means. Water must be excluded from these sockets and they are therefore sealed with pitch.

The top sides of the hardwood blocks are counterbored to receive the nut so it will be flush with the top surface, and this cavity is also sealed in the same manner after the nut has been set up with a socket wrench. Properly preserved these hardwood blocks will last as long as the rails and in general will only need to be renewed as new steel is laid. The exposed portion of the channels between the concrete blocks is preserved with a wash of pure Portland cement. Elm plugs are embedded in the concrete to receive the points of the spikes. These are on the end of the grain and have a ⅜-in. hole through the center which corresponds with a ⅜-in. hole in the hardwood blocks. The size, number and arrangement of the plugs and holes can be made to suit circumstances. Spikes will hold better when driven through and guided by a small hole than when driven in the solid wood. Straight spiking is a necessity and is thereby assured.



Combination Concrete and Steel Cross Ties.

As to the mixture for the concrete blocks, good ordinary concrete of native Portland cement answers all requirements. Broken stone can be used or any material from coarse sharp sand and pebbles, to medium gravel.

All the ties made up to date have been of concrete mixed in the following proportions:

Broken stone concrete.

Cement, 6 parts	6
Broken stone, 11 parts, Sand or fine gravel, 3 parts	14
Total	20

The broken stone should pass through a 1½-in. screen and be clean and free from dust.

Gravel concrete.

Cement, 6 parts	6
Medium gravel, 14 parts	14
Total	20

None of the pebbles were larger than 1½-in. diameter. Atlas cement was used in every case and the concrete was mixed rather wet.

There are three methods of moulding, all of which are applicable:

First: The machine method, using metal moulds with false bottoms and drop sides, with provision for pneumatic tamping, the same as are now in use for moulding building blocks.

Second: Wooden moulds with bottom and sides in sections, and held together by clamps when in use.

Third: With sand moulds as in a casting floor.

The first method answers for concrete mixed as dry as possible. The second method answers for medium wet concrete, and the third for very wet concrete and fine materials.

In every case the tie is moulded upside down, and a plank (on which are fixed in proper position the plugs and sockets) forms a false bottom for the mould. The steel channels are then supported in place and the mould filled in.

The first tie made was moulded on the ends of a piece of 30-lb. rail, and old rail, aside from the question of economy in metal, is as good as anything else for the purpose.

Except in one case all the ties made have been put in singly between wooden ties, that being the most severe test that could be devised, as the entire concentrated load on each pair of wheels was thus borne by the concrete tie.

There have been no failures, and there have been no changes in the original designs except to reduce the weight of steel from 4 lbs. to 3 lbs. per foot.

The following mechanical tests have been made:

A concrete block containing channels was placed on supports, spaced 2 ft. in the clear and pressure applied on the head of a rail bearing on a wooden block the same as if laid in track. Failure began with a maximum load of 90,000 lbs.; only a faint crack appeared and the tie remained in serviceable condition.

The second test was made to determine the adhesion of concrete on steel, and pressure was applied to slip the channels through the concrete block. The block was 1 ft. long and required 78,000 lbs. to start the channels, equal to 303 lbs. per sq. in. of concrete and metal surface.

A block of broken-stone concrete containing channels was placed within a large box filled with gravel so that the ultimate strength might be obtained under conditions somewhat like those in actual service. This block failed under a load of 82,400 lbs.

A second block of gravel concrete without channels, tested under the same conditions, failed under a load of 143,600 lbs.

It is a singular fact that in both these tests the concrete did not fail by fracture transversely as would be expected, but split longitudinally. The first tests were made in the machine shop with an ordinary wheel press. The last two tests were made by Robt. H. Hunt & Co.

The estimated cost and weight of the tie are as follows: by roads not using it.

Iron and steel	$0.58	52 lbs.
Concrete	0.50	374 "
Wood blocks	0.12	10 "
Royalty	0.10	...
Total	$1.30	436 lbs.

The cost figures are based upon a normal or average market, and the cheapest grade of steel obtainable is supposed to be used.

Besides its use in ordinary track the concrete tie has two other valuable applications, as follows: For use in streets, paved or unpaved, where drainage is poor or impossible, for subways, tunnels, and in place of ballast for bridge floors. The Pere Marquette R. R. laid on Jefferson avenue, Bay City, Mich., in 1902, 3,400 ft. of single track on concrete ties. The track occupied the center of the avenue, which was to be paved. In connection with the paving a 9-in. course of concrete, 8 ft. wide, was put down for the track foundation, and on that, concrete ties were laid, being bedded with a joint of cement mortar and set to grade with a level. The blocks of concrete may be tied together with channels as shown if thought desirable, but this seems hardly necessary when bedded in the concrete of sub-pavement.

After the track was laid and the sides of the street paved the track was filled in with concrete and paved. The wood blocks were treated with carbolineum. The result so far is highly satisfactory, and while all things depend upon the test of time, the worst that can happen will be the renewal of the hardwood blocks, and that at long intervals.

The difficulties of maintaining track on ballasted bridge floors, and preventing corrosion of the metal surfaces that are particularly exposed under such conditions, are well known. My proposal is to fill in with concrete, wholly or in part, the pocket or cell that commonly holds the ballast, and to form the upper surface of the concrete to hold the hardwood blocks for the rail surface, as before. The track thus becomes an integral part of the structure; is actually permanent within the limits of the life of the rail—which is thereby increased—and the effects of impact and vibrations are reduced to a minimum.

In designing new structures, provision should be made to nearly fill the pockets with concrete. Because of the perfect support thus afforded for the web and bottom plates of the floor, more than enough saving can be made in the ordinary sections to provide for the increased dead load. In designing such floors, the distance between centers of cells should be an even divisor of the rail length, so that all the joints may be supported or suspended, and all fully spiked. So far no attention seems to have been paid to this important detail.

The preservative property of cement and concrete does not seem to be generally understood, or if understood is rarely applied. It is only necessary to remove loose scale and foreign material to secure the best results. An incidental advantage in treating such structures in the way proposed, consists in the fact that the heavy rumbling noise so objectionable in towns and cities, will be largely diminished.

In general, concrete ties can be made to the best advantage on the line of the road using them, and at or near the source of supply of the broken stone or gravel. There are also various other materials, like the waste from zinc and copper mines, that will make good concrete where gravel and stone are not readily available.

The advantages to be derived from this form of construction may be summed up as follows:

Economy in fuel consumption (or what is the same thing, an increase in train tonnage), and reduction in the

*Extracts from a paper by Mr. G. H. Kimball, M. Am. Soc. C. E., presented to the Western Society of Engineers, Sept. 16, 1903.

cost of running repairs of locomotives and cars, both due to perfectly smooth track that will not yield unequally.

The chief advantage, of course, is in eliminating the cost of tie renewals, but there is no item of expense under the head of roadbed and track labor, or of the materials handled in that connection, that is not favorably affected to a greater or less degree. The fact that it will no longer be necessary to break the bed below the tie means much in saving of labor as well as in maintaining the best track, with the added advantage of preventing waste and wear of ballast.

Perfect adjustment of the load to the bearing surface of the rail on the tie, and of the pressure on the base of the tie to the conditions of the roadbed are permitted and required. Under such conditions the settlement of track would be uniform and would be reduced to a minimum.

The simple fact alone that even spacing of ties becomes imperative goes far towards securing the best results in high-class track, while with joints better maintained we may confidently expect an increased length of life for rails. Shimming and adzing will be reduced to a minimum and aside from that due to heaving, will entirely disappear.

A further advantage is obtained by preventing the widening of the gage on tie plates, and both the widening of the gage and cutting of the ties where tie plates are not used, this action being due to the springing of the ties and the consequent canting of the rails outward from the vertical when under load.

Increased stability due to greater weight of track construction is a decided advantage, and doubling the end area embedded in the ballast will prevent change of alinement, while better surface drainage and greater freedom from snow within a wide range of latitude due to elevating the base of the rail 4 in. or more above the ordinary level of the ballast, contribute largely to the general result.

It insures the best insulation for bonded track. Necessary variations in detail to suit local conditions are easy of adjustment. With track once laid on concrete ties an arbitrary reduction of section force can be made, and there is no standpoint from which the question can be viewed, except that of limiting present expenditure regardless of ultimate economy, that does not promise a large saving in maintenance-of-way charges.

The Shrewsbury Collision.

The Railroad Commissioners of Massachusetts, James F. Jackson, George W. Bishop and Clinton White, have made a report on the butting collision of street cars on the Boston & Worcester street railway, July 25, in Shrewsbury (heretofore reported as at Westboro). The essential portions of the report follow:

On July 25, 1903, an eastbound car, proceeding upon its private right of way in Shrewsbury at about 25 or 30 miles an hour, while rounding a curve collided with a westbound car. The collision caused the death of one and serious injuries to many passengers. The westbound car should have remained upon the turnout at Westborough until the eastbound car had arrived.

The rule regarding meeting points is absolute, no car being authorized to leave such a point on the time of another car without an order from the proper officer. The Westboro turnout was a regular meeting point for these cars, plainly indicated on the timetable, neither car having the right to pass without waiting for the other. There is no ambiguity in the rule. The conductor and engineman disregarded it on their own responsibility. The turnout was about 8,000 ft. long and these men had only just taken charge of the car. There is a rule that in case of doubt the conductor and the motorman, after consulting with each other, may proceed with caution, by sending a flag ahead around curves. There was a telephone at the out-going end of the turnout, but this the men did not use.

"While the immediate cause of the accident thus appears to have been improper conduct on the part of employees, the possibility of such misconduct and of consequent loss of life and injuries was largely due to conditions for which the management of the company is responsible. The accident occurred in connection with the prosecution of an enterprise conspicuous above all others yet undertaken within this State, for the attempt through the operation of a street railroad to furnish facilities for passenger traffic which would rival those ordinarily found upon steam railroads. This involved the running of cars at a very high rate of speed.

". . . Inquiry shows the company seriously at fault in respect to the management of its railroad. It had adopted a method of car despatching through telephones established at different places along the line. This system when properly used is a safe one. The mistake as far as the public safety was concerned was not in the system but in the failure to provide for its proper use.

"As an instance indicative of the lack of appreciation by the management of the importance of the despatching department, it appears that upon the day of the accident the regular despatcher was permitted to be away from his post; and this at a time when the disarrangement of the running schedule made the work of that department indispensable."

The Board also finds that the very commendable rule established by the company, when it began business, requiring conductors and motormen to be examined on entering the service, had been utterly disregarded. Both of the men at fault in this case were employed on the recommendation of an outsider. There was no investigation of character or previous record, although one of the men had been reprimanded twice in his former place. Another rule which was disregarded was that requiring orders to be written by the conductor when received (over the telephone).

". . . In brief, the investigation of this accident discloses inefficient management. The owners of such properties have the immediate control over them, and it is in the exercise of this control that the due care must be found which is essential to the protection of employees and the traveling public. The remedies for the evils of careless management have been found in the civil liabilities to which it exposes the stockholders of the company and in the criminal prosecution of those personally responsible for carelessness, whether they be officials or employees. It is questionable whether accidents that arise from a failure to properly manage a railroad can be prevented by any other means than the enforcement of laws of this kind."

Station and Cross-over at Harrow—Metropolitan District Railway of London.

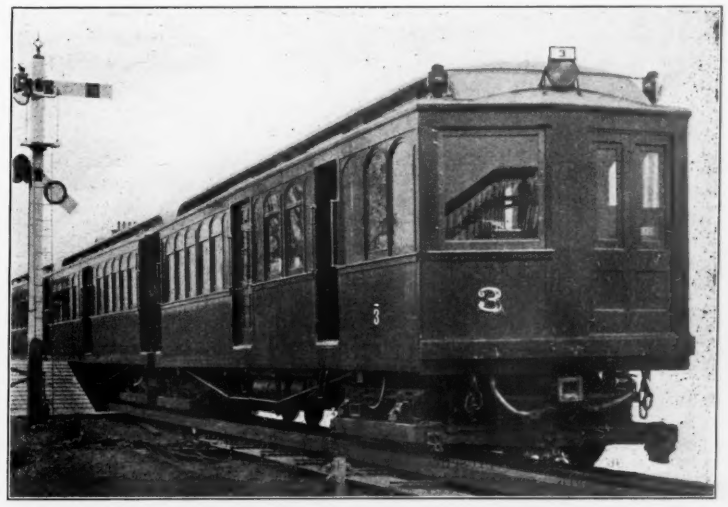
Multiple Unit Control on the London Tube Railways.

In the *Railroad Gazette*, May 22, 1903, was illustrated an experimental train equipped with the Westinghouse electro-pneumatic multiple unit system of control for the Metropolitan District Railway of London. Mention was made of a similar train equipped with the Sprague-General Electric system, the two trains to be run in competitive trials to determine which system was to be adopted for the road, which has recently been electrified. The tests have been carried out for the last three months on the Ealing & South Harrow branch of the Metropolitan District, which is the latest extension of the company's lines and equipped from the start for electric working. On the completion of the tests last month, the contract for the controlling mechanism for all the trains of the Metropolitan District was awarded to the British Thomson-Houston Co., the English branch of the General Electric Co. The contract will amount to about 150 train equipments. No decision has been reached as to the motor equipment.

The accompanying engravings show the experimental train equipped with the Sprague-General Electric multiple control system. They show besides the general appearance of the train, some interesting details of the track and conductor rail construction and the station and interlocking tower at Harrow. Current to and from the power house is carried through two conductor rails, insulated from each other and the track rails. One of these is placed on the outside of the track and is boxed in at the sides. The other is placed centrally between the rails. The roadbed and interlocking plant are in accordance with standard English steam road practice. This branch is being operated by a small local power house pending the completion of the District's central station at Chelsea, which will be one of the largest in the world and will supply power for all the "tube" railroads controlled by the Yerkes syndicate.

Current is collected from each truck under the train by collector shoes mounted on a heavy wooden beam extending across the truck and supported by wooden beams bolted to lugs on the journal boxes. The two outside shoes are connected across, the main lead being carried up into the car just in front of the bolster. The station platforms are on a level with the car floor and platform steps on the cars are dispensed with. The cars have longitudinal seats and side and end doors.

Beside the contract just awarded there is another large contract for train equipment pending, that for the Metropolitan Railway of London. This road is now in process of electrification and some time ago the Ganz system of control was seriously considered, but as this road works the "Inner Circle" lines jointly with the District, it was advisable to have both roads use the same system and Mr. Yerkes objected strongly to the Ganz. The matter was submitted to arbitration and Mr. Yerkes's views prevailed. Mr. Yerkes' other roads, the Baker Street & Waterloo, the Charing Cross, Euston & Hampstead, and the Great Northern, Piccadilly & Brompton are all in process of construction, the first named being nearly completed. Some form of multiple-unit control will be used on all of these lines, the experience of the Central London with single motor cars having shown that excessive vibration is caused by the single heavy motor car. All of the cars of this road are now being equipped with the Sprague-General Electric system of control and the result has been to reduce the vibration to an inappreciable amount.



Sprague-General Electric Control System, Experimental Train.

Foreign Railroad Notes.

In the first half of this year Germany exported 4,386 kilometric tons of locomotives to British India, which was two-fifths of its total locomotive exports. Another fifth went to Spain.

The beet-sugar manufacturers in Austria have been clamoring for a reduction of freight rates on beets to the sugar mills and on sugar, etc., from them. The industry for years has been encouraged by bounties on exports. These have been abolished by the well known "Brussels conference," of nations producing and consuming sugar; and as Austria is more distant from the chief sugar consuming markets than most of the other producing countries, it perhaps is at a disadvantage. But how far the government would be warranted in making up by reduced rates on the State Railroads for the bounties abolished by international agreement is a delicate question. The mills have not been able to secure all they wanted with regard to raw materials to the mills, and at last accounts were uniting their efforts for a reduction of sugar rates.

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CONTRIBUTIONS.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

Excepting the improvements made in rails "we have made little real progress in the details of track construction in the past 45 years," says Mr. G. H. Kimball in his paper on the tie problem. His suggestion for the use of concrete in the form he proposes, is entitled to great respect, for as an inventor or designer he is such only as one of that splendid scientific sort who deduce the remedy from long experience and careful study. Mr. Kimball has had charge of permanent way for more than a quarter of a century, and was perhaps best known while he was chief engineer of the Lake Shore, and later, of the Pere Marquette road. In making his introductory statement he surely meant only so much as he said, and no more, for the quality of American railroad track in line, surface, curves and approaches to curves and, in general, capacity for easy hauling of loads not undertaken in any other country, is no more comparable with that of 45 years or of 20 years, ago than is an asphalt pavement with a turnpiked earth highway. We still use wooden ties, spaced not materially different from the old practice, and the chief engineer of one of America's greatest railroads has recorded the prophecy that we shall continue to use them "until white oak ties cost more than a dollar." His prophecy, however, was based on a lot of experiments with different forms of metal ties, and he was not at all moved by the estimates of the available, visible, timber supply in this country. That at the present rate it will be consumed in 30 to 50 years did not at all affect his judgment of the best foundation now economically available. It is well to not cross bridges until we come to them, and no all-metal tie has even come near the requirements. The design and the estimated cost of the concrete tie comes nearer and is encouraging. The cost, $1.30, is not prohibitive if it secures the expected permanency and favorably affects the cost of maintenance. This cost tends to continually increase somewhat in proportion to the loads rolled over the rails, indicating no improvement in track methods. On one division of a road where we have been allowed to see the figures, the maintenance cost for the past year was $547 per mile of single track, but this figure is misleading without the note that the new rail laid was much heavier than the old rail.

Punishment of strikers in Australia is severe and their treatment has been most unsocialistic. The case of each individual has been considered separately in a fashion disheartening to the trade union teaching that "all coons look alike." When Mr. Thomas Tait, late of the Canadian Pacific, arrived at Melbourne last May to assume his new duties as chairman of the Victorian Railways Commissioners, he found a large proportion of the enginemen on strike and their places in part taken by non-union men to whom double wages had been guaranteed for two months. This temporary arrangement gave him a breathing spell and a chance to examine the laws applicable to the situation. Paragraph 3 of the Railways Employees Strike Act is as follows:

> Every officer and employee in the railway service who has become a striker shall without any order of removal or dismissal by the Commissioners be deemed to have ceased immediately on becoming a striker to be an officer or employee in the railway service, and to have forfeited all rights (if any) to any future pension, gratuity or retiring allowance, and also all legal rights or privileges whatsoever arising out of or pertaining to his previous employment as an officer or employee, save and except as to any salary or pay due to him at the time of his becoming a striker.

It is strange indeed that this simple, logical, enactment should not be law and custom in every land and in every service. It is a truism, as old as civilization, that it takes two to make a bargain, and also that when one breaks it the other has the option of enforcement or of acquiescence. Nevertheless, its strict enforcement is severe on ignorant employees who are badly advised and taught by agitators the notion that a strike is the elementary form of redress. The enginemen of this country have learned better than this. Fortunately the Victorian commissioners were authorized by the same act to exercise judicial functions; to reinstate, and, within limits, to remit the severe penalty of loss of pension and retiring allowances due to length of service. The Victoria Government Gazette, of date July 31, gives the names of the engineers and firemen who went on strike and whose cases have thus far been considered. Of men not reinstated, two-thirds of their "future gratuity" is allowed to 16, and one-third to 10 men. Of 1,155 men reinstated, full pension rights are given to 143; two-thirds rights to 85; one-third rights to 46; no rights to 8; and the cases of the remaining 873 men seem to have not yet been fully settled. Rather a severe lesson in what Mr. Roosevelt calls decency.

The Care of Steel Cars.

Maintaining steel cars, so far as careful painting with proper materials helps to maintain them, is a subject dealt with in another column. They are damaged and destroyed by corrosion, abuse and accident. Of these three agencies, corrosion is the least destructive. But this is a comparative statement only; it is really highly destructive, and its effects can, in a large measure, be reduced by careful painting with proper material. Much can be done by having the surface clean and bright before painting and using a good grade of paint. It has been suggested that all parts of the car should be dipped in a tank containing paint, or preservative coating, before assembling. This insures for a long time protection to all interior and inaccessible surfaces. It is still an open question as to what is the best paint, but the required qualities are well known; that is, that the paint should be elastic, impervious to the action of water or acid, and highly refractory. It is possible that in this matter we have not learned as much as we should have learned from the experience in foreign countries. In England and on the Continent, steel cars, and cars having steel underframes, built ten and fifteen years ago, are still running and in good condition. On one road in this country—one of the larger users of steel cars—an examination was made of the scale which formed on the inside and among the less accessible parts, and it was found that the samples analyzed contained but a small amount of iron oxide. The cars from which the samples were taken were running in a coal, ore and limestone service, and the scale which adhered to the plates was largely foreign matter and the accumulation of dust and dirt. When cars loaded with coal containing much sulphur are exposed to rain or snow, the water percolates through the coal and the oxygen from the air combines with the sulphur and produces sulphuric, or sulphurous, acid which attacks the steel plates in the sides and bottom of the car. There are two natural remedies for this condition. One is the protection of the steel by an efficient coating, which must be done if it can be done, and the other is a prompt unloading of the cars, which would do much to prevent this corrosion.

If the floor of the car is designed with no pockets for the accumulation of dilute acid, and provision made for draining the hoppers, there will be still less trouble. It is essential, of course, that all the joints and inaccessible members of the car frame be thoroughly protected from moisture when the car is built. A thorough coating with red or black lead, mixed thick, if properly applied, will prevent corrosion as long as the car holds together. Whenever the cars are brought into the shops for repairs, they should be given a thorough painting inside and out, after having the plates first thoroughly cleaned. It is false economy to spare paint; because good paint does prevent surface corrosion, but it is especially profitable for railroads to direct their energies toward reducing the abuse of the steel car, both at unloading points and on the road. Abuse is the most serious phase of the whole question. It starts from the building of the car and continues until it is out of service and in the scrap pile. The trainmen, the yardmen, the unloaders at terminals, the repairmen, everyone that has a chance to exercise ingenuity in inventing new abuses tries them, with the firm belief that the steel car will stand anything. "Exposed to daily fraud, abuse and wrong," it is overloaded, recklessly switched, hammered unmercifully with sledges and maul to start the load through the hopper, patched up indifferently and started out again on its round of misuse. Fires are lighted under the car to thaw out the load of coal or ore, frozen after being rained on. Wooden cars are treated with more consideration because they will not stand such treatment. It is quite as unreasonable to hammer in the side of a wooden car or light a fire under it, as it is to do these things to a steel car, and yet we hear complaints that the steel car is not lasting as long as it should.

The Grain Differential's Relation to the Canal Question.

In the arguments put forth by the advocates of the 1,000-ton barge canal, from Buffalo to the Hudson River, much stress has been laid upon the differential, which makes the grain rate from the west to New York higher than the rate to the southern ports. The implied argument in each case seems to be that this differential is a wicked and arbitrary measure, designed solely to harm New York, and that if a state-supported waterway be built, the alleged discrimination will thereby be forcibly removed. Indeed, it is evident that many canal advocates believe that the canal will serve as a rod for chastening the railroads, and that this punishment will be a species of retaliation well deserved. A good example of this bitterness towards the railroads because of the differential is found in the following excerpt from the report of Governor Black's commerce commission:

"To offset all the advantages enjoyed by New York City by an inland discriminating rate against New York is an arbitrary imposition of a burden upon all the export products of the territory tributary to New York in the competition to which they are subjected in the markets of the world. Such an imposition is not only indefensible from any standpoint of legitimate competition; it is not only an injury to the Harbor and to the State; it is a crime against the commerce of the nation."

By way of avoiding the controversial spirit which unfortunately has so largely characterized the arguments on both sides of the canal question, and for the purpose of making thoroughly understood the point at issue, it is of interest to examine the purposes and history of the grain differential.

In January, 1882, Messrs. Allen G. Thurman, E. B. Washburne and Thomas M. Cooley (afterwards chairman of the Interstate Commerce Commission) were requested by the four great eastern trunk lines, the Pennsylvania, New York Central, Baltimore & Ohio, and Erie railroads, to act as an advisory commission upon the differences in rates that should exist, both eastwardly and westwardly, upon all classes of freight between the several terminal Atlantic ports. Mr. Albert Fink, representing the trunk lines, informed the committee that the railroad managers desired to take no further part in the inquiry, but were ready at any time to furnish such information as might be peculiarly within their knowledge. The committee therefore sent circulars to the commercial organizations in New York, Philadelphia, Boston and Baltimore, and also in certain interior cities, and held hearings much in the manner that they are now held by the Interstate Commerce Commission.

At that time, taking the charge from Chicago to New York as standard, the rate to Boston was the same; there was a differential of two cents per 100 lbs. in favor of Philadelphia, and of three cents in favor of Baltimore. The committee found that the maintenance of this differential, in common with differentials in general, was due to three basic principles, which they described as being, respectively,

the principles of distance, of cost, and of competition.

The commercial representatives of Philadelphia and of Baltimore contended that freight charges on like classes of freight between the interior and seaboard cities should be governed by the first, or distance principle. Thus, if the mileage standard were adopted, the freight charges between New York and Chicago would have been about ten per cent. greater than those between Philadelphia and Chicago, and about 13 per cent. greater than those between Baltimore and Chicago, instead of the differentials of 6⅔ per cent. and 10 per cent. respectively, which were in force.

The arguments of the New York interests which rejected the distance principle were inclined to favor regulation of rates under the second heading, that of cost of service, on the ground that the New York Central could haul grain more cheaply than the other roads on account of its favorable grades, and that the rate should accordingly be lower. The committee struggled manfully with the perplexing elements involved in cost of service, and reached a conclusion somewhat similar to that of Mr. Bliss, formerly President of the Boston & Albany, who said in testimony that no one knew how much it cost a railroad to haul a ton of freight a mile except a legislator in his first year of service: that after the first year, he did not know. The committee decided, in brief, that the only tangible evidence of cost (the average ton-mile rate, which was considerably in favor of the southern lines) was wholly useless, because the average involved was made up of so many conflicting elements. But they held that it was important, both for the cities served and for the railroads, that traffic should be shared by all the rail routes. This necessitates not only that the rates should be equal on all lines, but also that no one of them should be obliged to do business at a serious loss, since, if certain interests profited thereby, it would be equally certain that the railroad would be forced to recoup itself at the expense of other interests. Hence it appeared to the commission that if New York stood for the cost principle, it should consider not merely the road most economical to operate, but all the other roads contributing to the prosperity of the city.

The commission also reviewed at considerable length the third, or competition principle, as governing rates. The arguments against indiscriminate competition in rates, the damage to non-competing points, etc., are now familiar to all and need not be gone over. It was shown that the legitimate and beneficial results of competition were found in the gradual reduction of rates through increasing efficiency of operation, rather than in open warfare between competing lines.

The commission concluded, therefore, that there was nothing in the evidence they had received to show that the existing differentials were unjust, or that they operated to the prejudice of either of the Atlantic seaport cities. Differential rates came into existence under the operation of competitive forces; they bear some relation to relative distance and relative cost of service; they recognize the relative advantage of the several seaports, and they are subordinate to the great principle which compels the carriers of property competing between the same points and offering equal facilities to their customers, to make the same rates. It was recommended, therefore, that the existing differentials be not disturbed.

Since the report of this committee, the Interstate Commerce Commission has several times upheld and developed the fundamental points of the decision. For example, in 1898, a decision was given upon complaint brought on behalf of New York City by the New York Produce Exchange, alleging that the differentials, allowed by the defendant carriers on grain, flour and provisions from Chicago and other western points, in favor of Philadelphia and Baltimore, were unlawful under Section 3 of the Act to Regulate Commerce. It was then held by the Interstate Commerce Commission that the differentials were legitimately based upon the competitive relations of the carriers; that it did not appear that the carriers had exceeded the limits within which they were free to determine for themselves, and, accordingly, that the differentials complained of did not result in unlawful preference or advantage to Philadelphia, or Baltimore, over the City of New York.

These decisions have been reviewed at considerable length for the purpose of showing the belief of the arbitrators that the differential was due to competitive conditions, and was not inherently unfair, as has so often been alleged. The complainants in 1898 used practically the same arguments that have been used by the commercial organizations of New York City during the past two or three years, and opposed to them, the representatives of the southern ports made a strong case on behalf of the differential. The bearing of the decisions on the canal question lies in the fact that the differential may be said to exist, and to exist, both properly and lawfully, as an equalizer of the advantages offered by the several ports.

Suppose, therefore, that a canal could be built which could fulfil all the expectations of its advocates, and effectually lower the existing grain rate to New York, might it not then be logical to expect that the differential would again be adjusted to neutralize the temporary advantage thus given to New York? In a previous article it was pointed out that there was no evidence to show that railroad rates might not be materially reduced before the grain business was done at a loss. The result of such a state-supported transportation route, could it be made in the highest degree successful, would therefore be to force competition of a character more or less extravagant on the part of all the rail routes to tidewater. If the charge for carrying wheat were thereby reduced a cent a bushel, or two cents a bushel, the western farmer might be the gainer, or the Liverpool broker might be the gainer, but the gain to the City of New York does not appear. It may be taken as axiomatic that the railroad companies are going to remain in business, and no economic gain would be effected by forcing them to compensate on non-competitive charges for the damage done their competitive traffic.

On the other hand, as the Interstate Commerce Commission has pointed out, it is as important to the railroad industry that New York flourish as it is that any other port flourish. But that New York should be the only port, seems in no sense desirable, and it does not appear that such a condition, or a condition tending towards it, could be created by artificial interference, in view of the many and complex interests involved.

Block Signals for the Rock Island.

The Chicago, Rock Island & Pacific has begun work on block signaling its main line from Blue Island (Chicago), Ill., to Herington, Kan., a distance of 651 miles, and from Rock Island to Valley Junction, Iowa, 182 miles. The telegraph block system is to be used and the signals are the standard designs of the Union Switch & Signal Company. Double-arm semaphores will be used, each signal having a continuous light lens. The length of the block sections east of the Missouri River is from five to six miles, and west of the river the length will be about seven miles. We are informed that the company's plans are such that the work will be extended until all main lines are equipped with block signals.

In this news there are two significant features. In making plans for 833 miles at once, the company shows that the main consideration is the safety of trains, not conformity to an estimate of the surplus income that will be available during the next year or two; and in making the block sections unusually long—five, six and seven miles—the officers of the road show that they appreciate the true difference between the time interval and the space interval; appreciate that the space interval is the desideratum, howsoever long it is necessary to make the sections.

The disastrous butting collision of electric cars at Shrewsbury, Mass., in July, has been made the subject of a report by the Massachusetts State Railroad Commissioners, and its substance is given in another column. It opens with the significant statement that "it is not difficult to place the immediate cause of this disaster." Unhappily, this statement applies to most of the serious electric car collisions which nowadays take up so much space in the newspapers; and we have to record a butting collision in New Hampshire, causing the death of six persons and injuring 77, where the explanation is still more simple, if that be possible. At Pelham, on the Nashua division of the Hudson, Pelham & Salem Street Railway, Sunday morning, September 6, two electric cars met at full speed, with the disastrous results just noted. A Nashua car was started on a signal given for another. Starter O. A. Stevens, who, according to report, has been employed by various street railway companies for 20 years, said: "I gave the order by signal for the Lowell car for Canobie lake to start. The motorman and conductor of the car for Nashua took it to be a general order to start. I was busy for a moment and their leaving the square escaped my attention." The starter then tried to have the power shut off, and he also ran after the Nashua car, but the collision occurred before anything could be done. According to a statement by the General Manager, the formula used in starting was "all right, boys, go ahead." Another statement, ascribed to Stevens, is that the conductor and motorman who took an order not intended for them were green men. The road has a system of electric lights, intended to serve as a block signal system, but some of this apparatus had been destroyed in an electric storm on Saturday afternoon, and had not been restored. These facts are their own commentary.

The assertion of a recent magazine writer, that derelictions of experienced railroad men are generally due to some grief or anxiety which is never disclosed, or at least, is not known to the public, has, of course, a considerable basis of fact; though in the nature of things, this view can never be verified. A pathetic example may perhaps be found in this Pelham case. According to the *Haverhill* (Mass.) *Evening Gazette*, "Starter Stevens may have been thinking of his wife and an unborn babe at home while attending to his duties. Mrs. Stevens had been under the care of a physician all day, and the child was not born until Sunday evening." Another pathetic incident in the report is that concerning Motorman Mayes, who had both legs crushed. "When Mayes was taken from the wreck, where he was pinned by the heavy platform of the car from Pelham, he was lifted out beside the track and set up against the fence. 'Was I to blame?' he weakly cried to those about him. 'Tell me, was I to blame? I know I am going to die, but I can't die feeling that I caused it.' He was assured that he was not in the least responsible and that he had stuck to his post like a hero, giving up his life, it seemed, in his attempt to stop his car."

Atchison, Topeka & Santa Fe.

The report for the year ending June 30 shows a slight increase in passenger earnings and a considerable increase in freight, mail and express; gross earnings being $62,350,397 on 7,965 average mileage worked, as against $59,135,085 on 7,855 miles last year. The increase in operating expenses, however, due chiefly to increased sums spent for maintenance of way, structures and equipment, amounted to $4,527,842, as against $3,215,312 increased gross earnings, so that net earnings decreased from $25,225,817, in 1902, to $23,913,287, and the proportion of operating expenses to earnings increased from 57.34 to 61.65. About $1,000,000 of the increase in maintenance of way was due to repairs and renewals rendered necessary by the unprecedented rainfalls on many of the lines, which continued a large part of the year and culminated in the Kansas floods in June. At the time of these floods, the 66 miles of main line in the valley of the Kaw River, from Topeka to Kansas City, and the large terminal yards and buildings at Argentine and Kansas City were entirely submerged to a depth of from 3 to 16 ft., and the transaction of business through Kansas City was wholly stopped. Besides this, bad washouts occurred along the Missouri River east of Kansas City. The main line remained severed until the water receded and repairs could be made, although passengers and the mails were transportd by circuitous routes. Owing to the permanent character of the roadbed, bridges and buildings, however, the damage, although serious, was not so great as might have been expected. No attempt is made to estimate the loss of business caused by the interruption. The actual cost of repairs was approximately $500,000. During the fall and winter months, also, rain was almost unceasing in Southern Texas, so that loss of traffic and extensive repairs were occasioned on portions of the Gulf, Colorado & Santa Fe. On the other hand, some little compensation for these unusual conditions was received, in the improvement of agricultural traffic, caused directly by the abnormal rainfall.

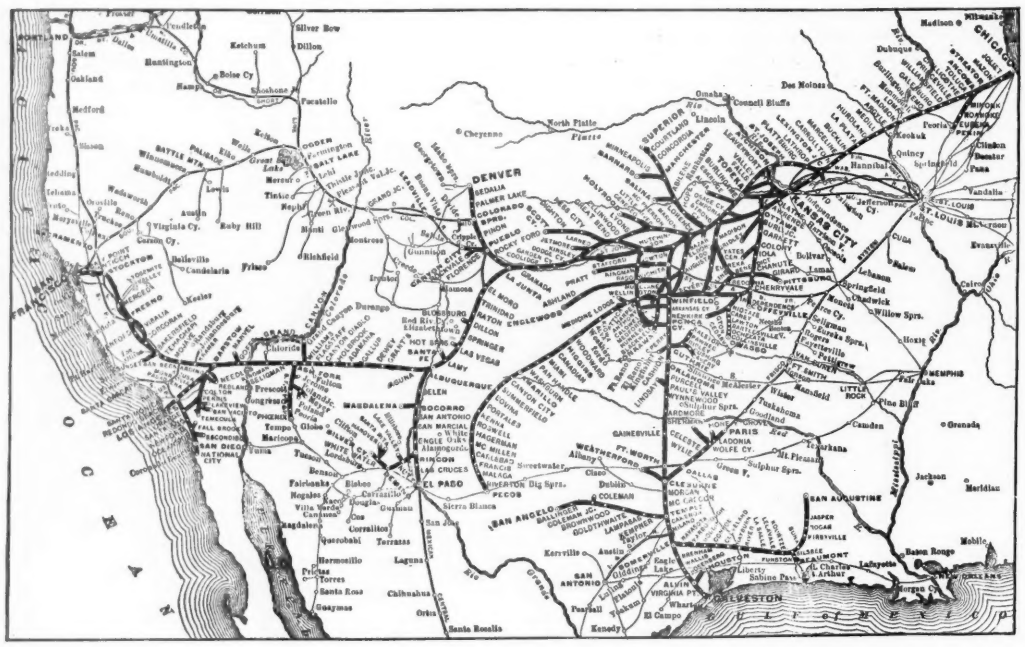
Provision was also made out of earnings for the purchase of 61,613 tons of rails, equivalent to 461 miles, for renewal purposes, chiefly in branch line work. The rebuilding of branch lines and building of other new branches called for a large quantity of rails which were obtained by the use of 61-lb. and 66-lb. rails from the main lines. These, in turn, were replaced by rails of 85 lbs. The cost of increased weight of rails amounted to over $500,000, all of which was charged to operating expenses. Thus, the charge for maintenance of way and structures amounted to $9,304,892, or $1,168 per mile, an amount more than a million dollars in excess of the highest previous charge for maintenance, although the expenditure per mile of line was slightly greater in 1898.

The charge for maintenance of equipment, $8,510,543, or $1,068 per mile, is also considerably in excess of any previous charge, although the difference is not so great as in the case of maintenance of way. The amount to the credit of the rolling stock replacement fund on June 30, 1902, was $211,687, and to this there was added during the year $1,601,484, of which all but $238,491 was charged to operating expenses, the balance having been collected in cash for old cars and engines sold. Thirty locomotives and 273 freight cars to a total value of $1,256,441 were acquired during the year by the use of this replacement fund, and an unexpended balance of $556,731 was carried forward. In addition to the rolling stock paid for out of earnings, 45 locomotives, 36 passenger cars and 3,269 freight cars, costing altogether $3,496,717, were bought during the year and charged to capital, in addition to which 100 locomotives, 2,700 freight cars, 19 passenger cars and 300 miscellaneous cars were contracted for, but had not been delivered at the close of the fiscal year. These figures are given in some detail to show the efforts the road is making to increase and better its equipment, for it will be recollected that $2,661,450 was expended from earnings for the same purpose last year, and $7,226,773 from capital, making a total of $14,641,381 spent on equipment in two years. Over 21 per cent. of the locomotives in service last June and over

28 per cent. of the freight cars in service at the same time have been acquired since 1901.

The results of the use of this new rolling stock on the economy of operation are shown by the fact that the average train load increased during the year from 247 tons to 279 tons, or about 13 per cent., while in 1901 it was about 243 tons. Tons of revenue freight carried one mile increased 11.2 per cent., while freight car mileage increased only 5.3 per cent., and freight train mileage only 1.76 per cent., an excellent showing.

Gross earnings from operation, with the addition of income from other sources, amounted to $63,668,391, and after the deduction of all operating expenses and fixed charges, the resultant net income was $13,898,329, which is equivalent to 5 per cent. on the preferred stock and a trifle over 8 per cent. on the common. The dividends



Atchison, Topeka & Santa Fe.

paid aggregated 5 per cent. on preferred and 4 per cent. on common, however, the same as for the year previous, and over $3,285,000 was written off property accounts for betterments, equipment, discount on bonds, and appropriation to the fuel reserve fund. Thus the aggregate charges to profit and loss were $13,072,084, and the surplus carried forward, increased by the current balance, now amounts to $16,853,660. The item of income from other sources than operation amounted to more than 1¼ millions, and during the fiscal year nearly $580,000 was received as net proceeds of lands embraced in the Santa Fe Pacific Land Grant. The latter sum was written directly off the book value of railroads, franchises and other property, however, and the transaction does not appear in the income account.

Changes in the funded debt outstanding were relatively slight. The net increase since July 1, 1902, was $3,457,000, but mileage also increased 127 miles, so that the funded debt per mile of road owned now stands at $28,501, as against $28,882 last year, and the interest charge is $1,152 per mile, as against $1,168 last year. Most of the expenditure for new railroads was on account of the Eastern Oklahoma extension, 91 miles of which had been built by last June, but had not at that time been turned over to the operating department. Since the last annual report, the Santa Fe Pacific Railroad, 875 miles long, and the San Francisco & San Joaquin Valley, 372 miles, have been transferred to the Atchison, and during the last fiscal year were operated by it directly. A number of new extensions, chiefly through comparatively undeveloped territory, are building or authorized at the present time. The most important of these is a line to be built under charter of the Eastern Railway of New Mexico, leaving the Rio Grande Valley at Belen, 30 miles south of Albuquerque, and extending 250 miles eastward to Texico, connecting the western lines with those in Kansas and Texas by a route shorter and with better grades than the present route. The first section of this line, 55 miles, is now building.

The following table, showing increases in the earnings for seven years, is of interest.

Year ending June 30—	Gross earnings. from operations.	Average per mile of road.
1897	$30,621,230	$4,752
1898	39,214,099	5,654
1899	40,513,499	5,761
1900	46,232,079	6,297
1901	54,474,823	6,977
1902	59,135,085	7,528
1903	62,350,397	7,828

Below is a summary of the most important statistics of operation for the past year, in comparison with 1902:

	Year ending June 30, 1903.	Year ending June 30, 1902.	Increase.
Earnings—			
Passenger	$13,469,986	$13,439,384	$30,601
Freight	44,622,439	41,815,607	2,806,832
Mail and express	3,411,698	3,089,123	322,575
Miscellaneous	846,275	790,971	55,304
Total earnings	$62,350,398	$59,135,085	$3,215,312
Operating expenses—			
Maint. way & struct...	$9,304,892	$6,141,466	$3,163,426
Maintenance of equip..	8,510,543	7,864,951	645,592
Conduct. transportation	19,023,145	18,442,438	580,708
General expenses.....	1,598,530	1,460,413	138,117
Total operating exp.	$38,437,110	$33,909,269	$4,527,842
Net earn. from opera..	$23,913,287	$25,225,817	*$1,312,530

*Decrease.

Norfolk & Western.

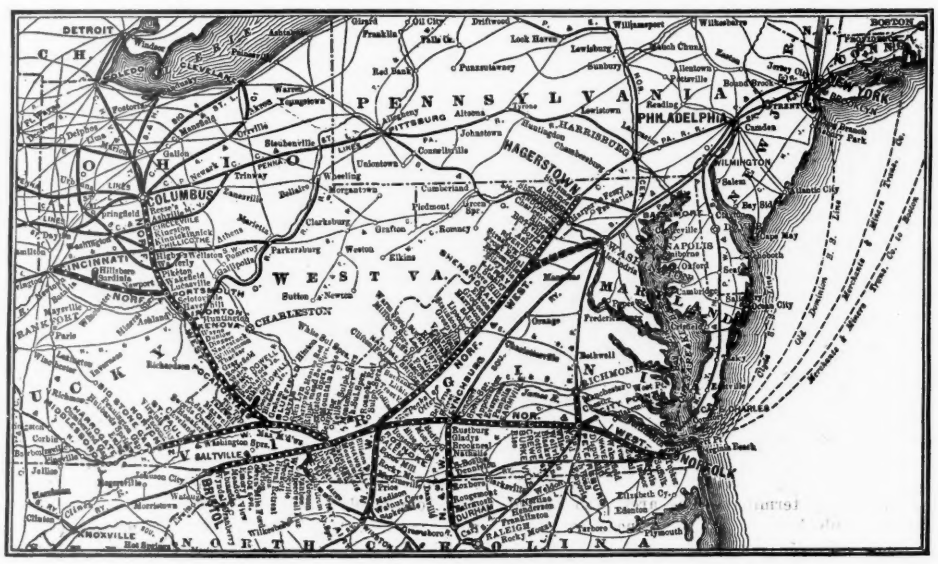
The annual report for the year ending June 30 shows gross earnings of $21,160,675, which is $3,608,470 more than in the previous year. Net earnings increased $1,047,267, and operating expenses $2,561,203. This increase in expenses is due to larger expenditures for conducting transportation and maintenance of way and equipment, and is quite in accord with the policy of the company as stated by Chairman Fink. The road's freight traffic is nearly all soft coal and other coarse articles, which yield a small profit. To handle an increased quantity of freight of this kind at a minimum of cost, the company has aimed to put its property and equipment in the best condition possible. Thus, the charges for maintenance of way are $2,754,200, or about $1,608 per mile of road, as against $1,271 the preceding year. This increase of about 29 per cent. is due in large part to extensive reduction of grades, reballasting of roadbed, and the substitution of 85-lb. rails for those of lighter pattern. Besides these charges to maintenance of way, a charge of $1,712,285 for improvements, is made to the surplus betterment fund. The maintenance of equipment expenses for the year, $3,041,414, show an increase of about 30 per cent. over 1902. A charge amounting to $1,500,000 for new rolling stock is also made to the betterment fund. The increase of $1,161,359 in conducting transportation is due in large part to the higher cost of materials and labor, as on every other road. A few of the most important statistics of operation are given below:

	1903.	1902.	1898.
Miles of road operated.	1,713	1,677	1,565
Gross earnings	$21,160,675	$17,552,205	$11,236,123
Net earnings	8,463,245	7,415,977	3,350,024
Exps. main. equip.	3,041,414	2,334,586	1,727,899
Main. way	2,754,200	2,131,048	1,542,978
Conduct. transportation.	6,014,468	4,853,109	3,974,472
Gen'l expenses and taxes.	887,348	817,484	640,750

The increase in receipts is due largely to the demand for soft coal which contributed about 45 per cent. of the total number of tons moved. The total number of tons carried during the year is 14,110,181, an increase of 1,842,081 tons, or about 15 per cent. The number of tons carried one mile increased about 15.5 per cent., thus showing a slight increase in the average freight haul. The average ton mile rate on all freight is 4.86 mills, against 4.63 mills in 1902, and 4.66 mills in 1901. Passengers carried are 3,169,574, an increase of 538,959, which makes a total increase during the past five years, since the reorganization of the company, of 88 per cent. This growth of freight and passenger traffic, and of rates, with the economic improvements which have been carried out in the maintenance departments, has not only enabled the company to set aside $2,500,000 for the betterment fund, $540,000 for future equipment expenditures, and to pay the regular 4 per cent. on the preferred stock, and 3 per cent. on the common stock, but has left an increase in the net income for the year of $917,094.

During the year the funded debt increased $3,002,000, the proceeds being used to pay off floating debt. Through the issuance of equipment trust certificates, the company has provided for 67 new freight engines, six passenger engines, and 1,000 freight cars. The company also, as just mentioned, has created a fund for the future acquisition of cars and engines by setting aside $540,000, and charging it to maintenance of equipment.

In accordance with its policy of constantly improving its property, the company has built several new branches to coal fields, and reduced grades extensively on the main lines, in order to lessen the cost of hauling the constantly increasing shipments from the Pocahontas coal fields. The total mileage operated at present is 1,713, an increase during the year of 36 miles, and work is now in progress on the Kenova, Tug Fork and Widemouth branches.



Norfolk & Western.

TRADE CATALOGUES.

The Railroad Supply Co., Chicago, has sent us Catalogue No. 5 of its highway crossing signals, block signals, and signal and electric supplies. Prices and illustrated descriptions are given of the "Chicago," R. & H., American, O'Neil and other highway crossing alarms and signals as well as miscellaneous signal material made by the company. Wire diagrams are shown of the company's plans for arranging highway crossing bells for single track and double track, and for single track movements on a double track road; also for crossings where, an approaching train having stopped, it is desired to stop the ringing of the bell and have the train start it a second time; also diagrams of drop annunciator circuits and of automatic block signal circuits. There is a table of train speeds showing miles per hour as related to feet per second.

Newton Machine Tool Works, Philadelphia, has issued Catalogue No. 36 of the general machine shop equipment which it makes. This includes all sizes of plain and horizontal milling machines for general and special purposes, rotary planing machines, slotters, cold saw cutting-off machines, radial and horizontal boring mills, multiple drills and numerous types of special machines for all purposes.

Crocker-Wheeler Co., Ampere, N. J., has had reprinted and published as Bulletin No. 35, an abstract of a series of articles on the Collinwood shops of the Lake Shore. Its title is "The Equipment of a Railway Shop" and it deals particularly with the installation of electric individual and group drives in these shops. The pamphlet is illustrated with drawings and half-tones showing the general scope of the installation and examples of motors attached to heavy machine tools. Much of the electrical equipment of these shops was furnished by the Crocker-Wheeler Co.

Hammacher, Schlemmer & Co., New York. Catalogue No. 1,036 issued by this company, describes the small tools

which it handles. The company is a large retailer of mechanics' and tradesmen's tools, selling direct to the user in any desired quantity. The catalogue, which is substantially bound in cloth and has more than 800 pages, is accompanied by a liberal discount sheet. It contains illustrations, sizes and prices of all the standard makes of machinists', metal workers', carpenters', pattern makers', and contractors' tools, and will be sent free to any address.

From Start to Finish is the title of a little pamphlet sent out by the Rodger Ballast Car Co., Chicago, in which the principal features of the Hart convertible car are briefly stated. The facts and figures given are convincing and show the savings accomplished by using this type of car for ballasting or construction work.

Crocker-Wheeler Co., Ampere, N. J., issued for the recent American Street Railway Convention a number of special bulletins, among which was one on generators for railroad power houses, describing the details of construction of that type of machine as made by this company.

The Gold Medal Camp Furniture Manufacturing Company, Racine Junction, Wis., has issued a neat 120-page catalogue. The list of articles includes locomotive cab seats, Badger car movers, stretchers, gage glass cutters and other railroad specialties.

The Traveling Engineers' Association.

The eleventh annual convention of the Traveling Engineers' Association was convened at the Stratford Hotel, Chicago, Tuesday, Sept. 8. The Association was welcomed to the city by Mr. L. E. McGann, Acting Mayor. He made a strong plea for the prevention of black smoke in cities. Mr. A. L. Humphrey, Western Manager of the Westinghouse Air-Brake Company, made an address. In part he said that the modern heavy locomotives have increased the care and responsibility of the traveling engineer but that many of the obstacles which appear to be insurmountable will disappear if the usual "railroad energy" is shown. The traveling engineer can do much to bring about a more perfect co-operation between the mechanical and the operating departments, and it should be the duty of the traveling engineer to see that every locomotive receives proper attention in the shop and at the terminals so that trains are moved without delay. He referred particularly to the necessity of having an efficient organization and at all times maintaining proper dignity so as to gain the respect and confidence of the men. Good organization and thorough co-operation make up in part for defects in material equipment and maintenance. Modern conditions call for men of a higher standard than heretofore and "unless something is done to induce young men of proper qualifications to enter railroad service, the rank and file will be the reverse of what our requirements demand."

Mr. F. W. Brazier, of the New York Central, gave a short talk, which was followed by an address by President D. Meadows. The President said that the work of the traveling engineers was getting better and that this result was in a large measure due to the able papers presented at the conventions. The Secretary's report showed the present membership to be 446—an increase of 9.3 per cent. over 1902. The Treasurer's report showed a balance of $400 on hand.

Resolutions were read on the deaths of Messrs. P. M. Arthur (Brotherhood of Locomotive Engineers); J. V. Murray (Westinghouse Air-Brake Company); J. R. Belton (B. & O.); and F. W. Marvin (Michigan Lubricator Company).

The first committee report was: "How Do You Consider the Use of the Brick Arch in Engines Burning Bituminous Coal in Deep, Shallow and Wide Fire-Boxes?" This subject was discussed at some length and numerous tests were cited, most of which showed that the brick arch was a coal saver but that it increased the difficulties of the boiler maker in making repairs in the fire-box. Mr. J. J. Gill (N. Y. C. & H. R.) gave the results of tests on the Mohawk Division of the New York Central. The engines with the brick arch saved about one ton of coal per trip over those without the arch, but when the money value of the additional time required at terminals by engines with the brick arch is considered, the saving in coal is unimportant. In fast-freight service, the engines without arches gave as good coal records as those with the arch. Mr. W. J. Crandall (N. Y. C. & H. R.) said that tests made on the Western division of the New York Central with large compound engines indicated that tubes stopped up quicker without the brick arch than with it, but when the brick arch is not used, the tubes can be cleaned at any terminal. The arch also has a tendency to honeycomb the tubes. The engines steam better, however, when the arch is used. With the arch the fuel consumption was reduced about one ton in 133 miles and the temperature in the cab was reduced. Another member favored the brick arch and thought that it should cover about 35 to 66 per cent. of the grate area and 70 per cent. when the hollow arch is used. There should be no space between the arch and the side sheets.

On the Chicago & North Western the cost of maintaining the arch is about $4.95 per 8,000 to 9,000 miles. One engine in heavy suburban service showed a saving of $50 in coal in 10 days by the use of a hollow brick arch, the engine having run 2,800 miles. Mr. L. D. Gillette (N. & W.) said that tests on his road showed that engines without the brick-arch saved about 12 lbs. of coal per mile. The important factor to be considered is the rapidity with which engines can be handled without arches, which more than offsets any gain in coal consumption.

After considerable discussion on the subject of the "Most Satisfactory Method of Lubricating Piston Rods" the convention adopted a resolution advocating the use of a combination swab and oil cup for oiling valve and piston rods.

By invitation General C. H. Miller (Galena-Signal Oil Company), and J. H. Setchell (American Locomotive Company), made addresses.

The first order of business on Wednesday was the report of W. G. Wallace (C. & N. W.), the representative of the association at the Master Mechanics' convention. Mr. T. A. Foque, Mechanical Superintendent of the M., St. P. & S. Ste. M., was invited to speak. He said that the modern locomotive had reduced the cost of transportation but that the cost of maintenance has increased and the traveling engineers could render their companies great service by carefully looking after the condition of motive power and making efforts to reduce coal consumption. Lubrication is also an important detail and in most instances there is a tendency to use too much oil. On one road, with which he is familiar, the oil bill had been reduced $1,200 a month by careful inspection and attention to details. The tonnage rating is also important and the tonnage should be kept at the maximum required by the service without damaging the engine. It is the duty of the traveling engineer to investigate thoroughly and follow up any reported defects. He also referred to the necessity of maintaining dignity, firmness and thoughtfulness in the work so as to arouse the interest and obtain the help of the enginemen and firemen.

The report on "Traveling Engineers' Front-End Arrangement" was read by W. H. Corbett (Michigan Central). The discussion on this subject was long and at times somewhat acrimonious but many good points were brought out. The effect of changing the proportions and arrangement of the diaphragm and petticoat-pipes received its share of attention together with the theory of the action of the exhaust jet. Cases were cited in which good results were obtained when the area of the steam jet was apparently less than the area of the stack. This statement was refuted, however, by Mr. E. W. Brown (D., L. & W.), who thought that the steam jet seen in the center of the stack was due to condensation which makes the jet visible. Mr. Angus Sinclair (Railway and Locomotive Engineering) called attention to the great amount of information on the subjects of front-ends, exhaust jets, etc. He said that a careful study of the Master Mechanics' reports would clear up the difficulties of many and that the theories already established make it possible to design correctly a front-end, provided the conditions of each case are carefully studied. He thought it impossible to design a front-end to meet all conditions.

The convention finally passed a resolution, offered by Mr. W. G. Wallace, that the association adopt no front-end but use the work of the Master Mechanics' Association and Prof. W. F. M. Goss as a basis for further research. Furthermore, that most trouble in service is caused by lack of system in keeping the parts in order and not to defects in design.

The paper of Mr. A. L. Beardsley (Santa Fe) on "Care and Handling of the Compound Locomotive" was the first order of business on Thursday. Mr. W. J. McCarroll (Baldwin Locomotive Works) described the 4-cylinder balanced compounds recently built for the Santa Fe and called attention to the advantages of the crank axle and the balanced arrangement. He also showed photographs of the effect of hammer blows on the rail.

Mr. W. A. Buckbee (B. & A.) thought that compounds should be designed and used in the service originally intended for them. Mr. A. Stewart (U. P.) said that the men disliked the compound engines at first but now prefer the compound to the simple engine. The success or failure of the compounds depends on the care received at roundhouses. The guides, cylinder packing, etc., require particular attention on compound engines.

Mr. W. J. Crandall (N. Y. C.) had good results from compounds. They draw heavy trains better than simple engines. On the New York Central, trains of 90 loaded cars are hauled by compound engines. Of three compounds gotten in May, 1902, one ran 15 months (about 45,000 miles) without repairs, and the other two ran 12 months without repairs. He thought the tandem compounds were not as good as the cross compounds.

Mr. C. F. Richardson (B. & O.) emphasized the fact that the road wants the engine that will earn the company the most money for the least cost. Most of their compound engines are unsatisfactory but the Pittsburg cross compounds have done good work. On the B. & O. compounds went in the shop twice for machinery repairs to once for flue repairs but with the simple engines the reverse was true. Mr. Stewart said compounds were not allowed to drift on the Union Pacific.

Mr. S. L. Kneass (Wm. Sellers & Co.) read the report of the committee on "Main Check Valve Above the Water Line of Boilers." At the conclusion he also read extracts from an editorial in the *Railroad Gazette*, Feb. 27, 1903, on the importance of purifying water, as this subject has a direct bearing on the check valve question due to the rapid liming of the valve and passages where bad water is used. Mr. Conger (International Correspondence Schools) objected to the statement in the report that there is less resistance below the steam line in a boiler than above it and the convention voted to omit that portion of the report.

Mr. F. P. Roesch (C. & A.) read his paper on "The Combined Straight-Air and Automatic Engine and Tender Brake." The general sentiment favored the combined brake. Many of the members, however, did not seem to be familiar with its design, method of application, or action. Mr. W. E. Widgeon (T. H. & I.) said that the men claim that the combination brake saves 3 or 4 hours a day per engine in switching service. According to Mr. W. H. Corbett (M. C.) the Michigan Central has issued an order to equip all heavy power with the combination brake. Mr. J. Charlton (C. & N. W.) thought that the use of the combination brake a necessity if economy in operation is desired. With the automatic brake it is dangerous to release at slow speed while such is not the case with the combination brake. To come to a dead stop each time results in waste of fuel. He said that in a yard having 12 engines, the use of straight-air equipment would make possible the removal of one engine.

Mr. O. M. Foster (L. S. & M. S.) said that the straight-air brake is used successfully on his road and that the cost of repairs is insignificant, it being only necessary occasionally to adjust the safety valves on the air cylinders. They use the ordinary slide-valve feed valve. Before the use of the straight-air the orders were to stop after the speed was reduced to eight miles an hour or less. This device is also used on passenger equipment to avoid the severe jerk at the end of a long passenger train in stopping. In answer to a question Mr. S. J. Kidder (American Brake Co.) said that any reduction could be made with the straight-air brake, the same as with the automatic brake.

The association indulged in considerable discussion regarding a motion to change the name to "Association of Road Foremen of Locomotives," but the motion was overwhelmingly defeated.

Friday morning the first subject considered was "Is the Water Glass a Valuable Adjunct to the Successful Operation of a Locomotive?" The paper was read by its author, Mr. C. B. Conger. Mr. W. G. Wallace (C. & N. W.) said that the use of a water glass makes the fireman familiar with the method of carrying water and assists him in firing economically.

There was considerable discussion on the proper location of water glass and gage cocks, the experience being that the water in the boiler has a tendency to creep up the sides of the sheets. The convention adopted a resolution recommending that water glasses be used on all locomotives and if the boiler is designed so that the enginemen and fireman cannot both see the glass, then two glasses should be used. It was also recommended that the water glass and gage cocks be as near as possible to the center of the boiler head.

The following subjects will be considered at the 1904 meeting:

Committee Reports.—(1) Use of Grease on Locomotive Bearings; (2) Revised List of Questions for Promotion of Engineers and Firemen; (3) Steam Leaks; (4) Locomotive Front-Ends.

Individual Papers.—(1) Water Scoops; (2) The High-Speed Brake; (3) Location, Care and Type of Locomotive Headlights; (4) The Future Engineer. How to Obtain and Retain Him.

The officers for the ensuing year are: President, R. G. Davis, Illinois Central; First Vice-President, G. W. Wildin, Central of New Jersey; Second Vice-President, J. D. Benjamin, Chicago & North Western; Third Vice-President, A. L. Beardsley, Santa Fe; Secretary, W. O. Thompson, New York Central; Treasurer, James McDonough, Gulf, Colorado & Santa Fe.

The executive committee was increased to six and the following members were elected: For one year: J. A. Fox, Chesapeake & Ohio; F. P. Roesch, Chicago & Alton. For two years: E. W. Brown, Lackawanna; L. D. Gillette, Norfolk & Western.

The next convention will be held in Chicago.

The following companies had exhibits at the convention:

C. P. Ault, Chicago.—Samples of Homestead locomotive blow-off valves; also demonstrations of Superior chemical compound with samples of scale removed from boilers and feed pipes.

Aurora Metal Co., Aurora, Ill.—Full-size model showing application of the Lewis & Kunzer metallic packing and packing case. Also samples of packing and blue-prints.

Brush Lubricating System, Chicago.—Sectional model of Wade-Nicholson hollow arch; the brush lubricating system; section of Sarver equalizing and by-pass valve.

Crane Company, Chicago.—Locomotive muffler pop valves; globe and angle valves.

Dayton Malleable Iron Co., Dayton, Ohio.—Shop torches, engine torches, malleable iron coal picks with case-hardened points, wrenches and descriptive matter of the products.

Joseph Dixon Crucible Co., Jersey City, N. J.—Samples of graphite and graphite paint.

A. Leschen & Sons Rope Co., St. Louis.—Descriptive matter on cast steel and Hercules rope.

Michigan Lubricator Co., Detroit.—Blue-prints and sample of sight-feed locomotive lubricators.

Nathan Manufacturing Co., New York.—"Reflex" water glass.

Railway Appliances Co., Chicago.—Wash drawing of Q. & C.-Priest snow flanger; the Symington journal box and dust guards; descriptive matter of other railroad specialties, including Fewing's car replacer.

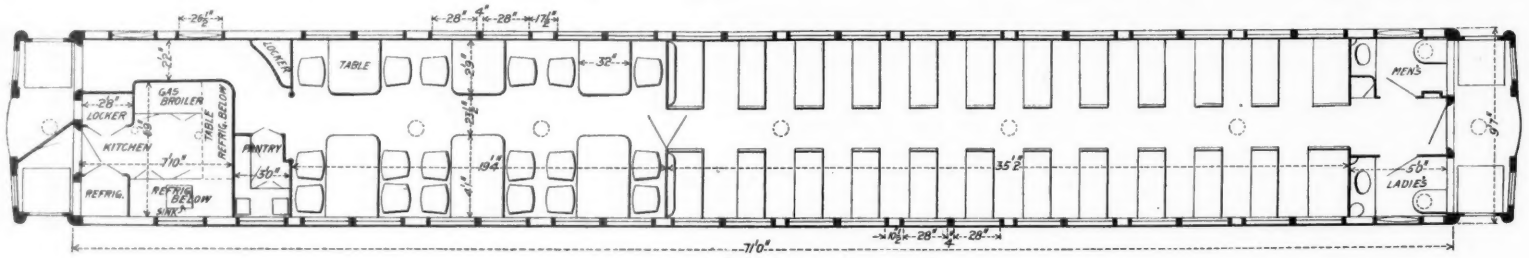
M. M. Rogers & Co., Chicago.—Improved journal packing.

Shelby Steel Tube Co., Pittsburg, Pa.—Samples of seamless boiler tubes. Also tubes showing results of tests.

Storrs Mica Co., Owego, N. Y—Samples of Mica headlight chimneys.

Parlor and Cafe Cars for the Monon.

The Chicago, Indianapolis & Louisville is having built at the Jeffersonville works of the American Car & Foundry Co., a parlor car and a cafe coach, each 70 ft. long inside. The interior arrangement of the cafe car is shown by the accompanying engraving of the floor plan. Half of the car is taken up by the coach compartment which is 35 ft. 2 in. long and has a seating capacity of 48. The dining room is 19 ft. 4 in. long with the tables arranged in the usual way and accommodates 18 people at one time. The kitchen is equipped with a gas range and broilers and ample refrigerating space. It is separated from the dining room by a small pantry next to the bulkhead. At the end of the car there are separate toilet rooms for women and men, each being provided with a wash basin and closet. A car of this kind is more satisfactory than one provided simply with a buffet, and on moderately long runs with the average traffic, serves the



Floor Plan of Cafe Car for the Monon.

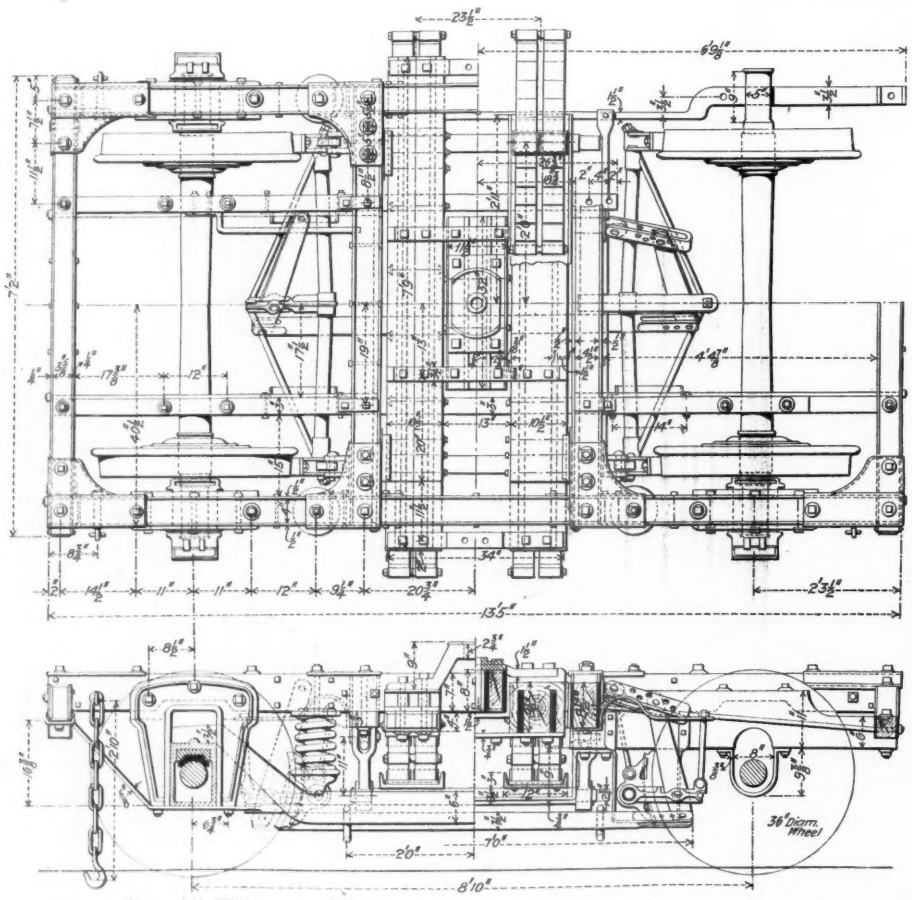
purpose of a dining car, obviating the necessity of hauling a whole extra car.

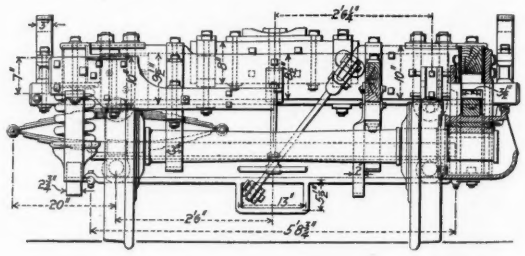
The parlor car contains 28 revolving seats of the usual pattern in the main compartment and has at one end an enclosed observation room, 9 ft. 6 in. long, containing eight wicker chairs. At the other end of the car, besides the ladies' toilet and saloon, is a single berth section that can be made up when required. A sofa occupies the space across the aisle between the bulkheads.

Both cars will be finished with inlaid mahogany. In the cafe car the coach seats will be Wheeler seats upholstered in figured olive green plush and the dining room chairs will be movable, upholstered in leather. Both cars will have semi-empire roofs, Pintsch gas, Westinghouse brakes, Consolidated steam heating apparatus, Sessions-Standard steel platform with C., L. & L. buffer attachment, McKee-Fuller steel-tired wheels, Norwood ball-bearing center plates and side bearings, Trojan couplers and American Car & Foundry Co.'s vestibules.

They will be mounted on the Monon's standard double bolster 4-wheel trucks shown in the engraving herewith. These trucks are similar in the construction and arrangement of the frames and equalizers, pedestals, etc., to the Pullman 4-wheel truck which, with slight modifications is standard on a great many roads. The principal difference is in the length of wheel base and the use of a double bolster supported on 4 sets of double, full elliptic springs resting on twin spring planks, but hung from one set of swing link hangers. The bolsters are 9½ in. x 10½ in. timbers, reinforced with two 1-in. sandwich plates and spaced 23½ in. apart, center to center. The center block is 8 in. x 11½ in. x 32 in. long and is supported on the bolsters by a substantial bridge of 1½ in. x 3½ in. iron straps. The spring planks are 12-in. channels resting on 3½-in. hanger axles. Instead of locating the side bearings inside the frame as is usual on 4-wheel trucks, the bolsters are extended beyond and under the side pieces and a side bearing support bolted across the ends. By the insertion of the double bolster, the wheel base is lengthened from 8 ft. to 9 ft. This gives 5 ft. center to center of equalizer springs as against 4 ft. for the Pullman 4-wheel truck and 8 ft. 9 in. for the Pullman 6-wheel truck. The distance from center to center of bolster springs is 23½ in. as against 5 ft. 1¾ in. in the 6-wheel truck. These dimensions are those on which the easy riding qualities of the truck depend and it will be seen at once that the double bolster 4-wheel truck has a decided advantage over the single bolster truck in the matter of equalizing distances but is still inferior to the 6-wheel truck. It has, however, the advantage of less complication of parts and greater rigidity of frame with less weight than the 6-wheel truck. This is the standard form of truck now used under all classes of equipment on the Monon and is giving excellent satisfaction in the matter of riding qualities and repairs.

We are indebted to Mr. Chas. Coller, Master Car Builder of the C. I. & L. for the drawings of the car and the truck.





Standard Four-Wheel Double-Bolster Truck of the Monon.

Lubricating Piston Rods.

The most satisfactory method of lubricating piston rods and valve stems was dealt with in a committee report to the Traveling Engineers' Association. A list of 18 questions was sent to the members by the committee, the report, of which the following is an abstract, being made up from the replies.

It is the consensus of opinion that lubricants should be applied to piston rods and valve stems by other means than by steam coming in short contact with the rods and stems. Some heavy freight engines have the crosshead traveling so close to the piston gland that a swab cannot be used, and even a small oil pipe from cup to piston rod could not be successfully used. Consequently it was necessary to change the design of the piston gland and core it out deep enough from the outer face of gland to admit a good-sized swab, and also cast a pocket on the upper part of gland and inside of outer flange that would hold a good-sized handful of waste; the oil hole leading from bottom of pocket to feed oil to the swab in cavity of gland, and another hole cut through the flange of gland and leading into the pocket for enginemen to apply oil to the packing in the pocket. This is a rather extravagant and unreliable method. For good results plenty of clearance should be given between the crosshead and piston gland when designing. The general opinion is that a good swab is the correct way of insuring constant lubrication. The only suggestion we would make is that the swab holders be of liberal dimensions in order to admit a good-sized swab.

If an oil cup is to be used a wick feed is preferable, as it is much more reliable than the needle feed and screw adjustment, as the sediment makes the needle feed-screw adjustment unreliable. The wick feed is taking fresh oil from the top at all times.

In view of the diversity of opinion relative to the temperature at which piston rods become heated on engines carrying 200 lbs. pressure, extensive experiments were made to determine as nearly as possible their temperature. These experiments were all made on a Schenectady consolidation engine.

1. Dry sulphur that melts at 239 deg. F. melted in 5 seconds when applied to piston rod.

2. An alloy of 1 part tin and 1 part bismuth (melts at 286 deg.) melted in 7 seconds.

3. An alloy of ½ part bismuth, 1 part lead and ½ part tin (melts at 300 deg.) melted in 10 seconds.

4. An alloy of ½ part bismuth, 1¼ parts lead, 1½ parts tin (melts at 310 deg.) melted in 12 seconds.

5. An alloy of ½ part bismuth, 2 parts lead and 2 parts tin (melts at 320 deg.) melted in 15 seconds.

An alloy of 2 parts lead and 3 parts tin (melts at 334 deg.) has been tried 50 or more times, but has not melted on any of the rods under the severest conditions, even on a new engine just out of the shop and piston rods quite rough, running six miles without lubrication except what they got from the steam, with lubricator feeding six drops per minute.

In all the other tests the piston rods were lubricated with engine oil on one side and valve oil on the other applied with a swab, but no perceptible difference was noted in the time required to melt the small pieces of alloy used, the pieces being of the same size.

Engine oil is all that is required for lubricating piston rods and valve stems, since the engine oil in use on our roads stands a flash test of from 350 to 380 deg. and any oil is a lubricant up to the flashing point. We are aware that the temperature of steam at 200 lbs. is 387½ deg., but having been unable at any time to melt the alloy that melts at 334 deg., it is evident that the loss of heat through the expansive action of the steam doing its work in the cylinder brings the temperature of the piston rods considerable below the flashing point of engine oil.

In an experiment with the wick feed-cup for piston rods a pair of cups were made holding about 3 oz. of oil. They have been in use 10 months and are regulated for one drop of oil per minute, feeding directly on the piston rod—no swab. When the cups were applied the packing on the high-pressure side had fused somewhat and in two months the packing had to be renewed. There has been nothing done to either packing since and the engine is making about 3,000 miles per month.

An experiment was made to learn what the results would be from handling an engine equipped with piston valves on the lines recommended at the last Master Mechanics' convention, namely not to drop reverse-lever from working notch while drifting. The engine experimented on was a Brooks 10-wheeler running in first-class service on the Delaware, Lackawanna & Western. After the engine had worked steam constantly from Scranton to Gouldsboro, 21 miles and a grade of 60 ft. to the mile, pressure maintained at 205 lbs. the entire distance, an alloy that melts at 286 deg. was applied to the piston rod on arrival at Gouldsboro, but it would not melt. After shutting off the steam and drifting down the mountain the reverse-lever was left in the working notch. The speed ranged from 25 to 32 m.p.h. The distance the

engine drifted was 24 miles, when speed was reduced to about 25 m.p.h. Relief valves only opened a very short space of time and only just a very small opening as the engine was passing the centers. When speed was above 25 m.p.h. the relief valves did not open at all. When about half way down the mountain the cylinders gave evidence of heating up. Engine oil was applied to the piston rods and a cloud of smoke arose from them. When about three-fourths down the mountain an alloy that melts at 286 deg. was applied to the outside of cylinder directly over the steam passage to front end of cylinder. Although the contact was poor on account of the scale on the cylinder, the alloy melted. On arrival at the foot of the mountain the alloy that melts at 310 deg. was applied to the piston rod and it melted in 5 seconds. An alloy that melts at 334 deg. came very near melting. It softened up so that the lead pencil with which it was held to the rod made an indentation in the metal. This engine's valves were blowing quite badly at the time this test was made. Otherwise the temperature would probably have been raised very much higher. It was also evident that if the speed had been increased to 50 or 60 m.p.h. the temperature in the cylinders would have been so high that lubrication would have been of no benefit.

On the next trip we experimented on the same lines with the exception of dropping reverse-lever to the corner while drifting, and at no time could the 286-deg. alloy be melted, not even on piston rod at foot of mountain. This practice of leaving the reverse-lever in working notch while drifting may not work any serious results if only practiced while drifting into stations, making stops, but it will not work on long descending grades, especially at high speed. The only way to keep the reverse-lever in the working notch when drifting is by the adoption of some automatic valve arrangement for relieving compression.

On the Norfolk & Western formerly all engines received their oil through a single pipe into the live steam chamber, below which there was a cavity with a drain pipe connected with cock, which is located between, and in line with cylinder cocks and is worked by same shaft. It was found that with steam shut off, as in drifting down grades, the oil reached no surface or bearing, but went into the cavity and through the drain pipe onto the ground. Therefore their last 140 modern locomotives were equipped differently. On these the oil pipe branches just above the valve cylinder, carrying oil to each end from the center and away from the steam cavity. This is a big improvement. They are now experimenting with a method of oiling cylinders while engines are working steam, and oiling the valves while engine is drifting. Two additional oil pipes are run from the two which now go to valve cylinder and connect to main cylinders at indicator plugs. At the point of divergence there is a valve which, when steam is being worked, closes the oil-way to valves and allows oil to pass directly into lower cylinder. It is found that the valve is sufficiently lubricated by the exhaust as it passes out. When steam is shut off this valve closes the way to the lower cylinder and leaves opening free to valve cylinder. The oil is caught by the two heads of valve piston as they travel and is reserved until steam is again admitted.

The report is signed by E. W. Brown, Chairman; Harry Vissering, W. H. Greene, W. C. Hayes, Joseph Keller.

Tests of the Union Between Concrete and Steel.

A recent issue of *Beton and Eisen* gives the results of a series of tests upon the holding power of different types of rods embedded in concrete, made in the laboratories of the Massachusetts Institute of Technology by Prof. C. W. Spofford.

Portland cement concrete was used, made in the following proportions by weight: one part, cement; three parts, sand; six parts, broken stone. This mixture was used in order that the results would correspond with tests upon beams and columns which were under way at the same time. The mixture, however, is very lean and would not again be used. The sand was clean, but rather coarse grained, containing approximately 47 per cent. of voids. The broken stone was a mixture of two parts of 1 in. trap, and one part of ½ in. trap. The mixing was thoroughly done by hand, the concrete being wet enough when tamped into the molds to flush water to the surface. The molds were, in some cases, not as tight as they should have been and some water leaked out, carrying with it some of the cement. It is not believed, however, that the loss thereby was sufficient to injure the results of the tests except possibly in a very few cases. The rods were all thoroughly cleaned by a sand blast, thus insuring uniformity in the surface conditions.

A 100,000 lb. Olsen vertical testing machine was used rigged with short uprights carrying the platform upon which the specimens were placed. The load upon the bearing end of the concrete block was distributed by the interposition of a sheet of ½ in. felt between the concrete and an annular steel ring resting upon the platform of the machine. In all cases the rod projected a short distance at the upper end of the block (the pull being downward at the lower end), and this projecting end was carefully watched in order to detect the first evidence of slipping. The rods used were round, square, flat, square but twisted through an angle of 20 deg. (Ransome rod), Thacher and Johnson. The table has been arranged from the original table in *Beton and Eisen* so that bars of the same size are together.

It will be observed from these tests that:

(1) Different type of bars of the same nominal size do not have the same net section.

(2) The results of tests of the small size bars are consistent but the results of tests with the 1⅛ in. and 1¼ in. bars show that the concrete was broken by indirect stress due to imperfect bearing in the testing machine and hence the adhesion or bond of the large bars was not determined.

(3) The bond of plain bars is not uniform. Other tests have shown that this bond is readily destroyed by shocks or repeated stresses.

RESULTS OF TESTS ON THE UNION BETWEEN CONCRETE AND STEEL.

No. of test.	Type of rod. in.	Size of concrete block, in.	Length of rod imbedded in concrete, in.	Breaking load, lbs.	Min. area of cross-section of rod, sq. in.	Shearing stress in lbs. per sq. in. of net section.	Stress on rod in lbs. per sq. in. of net section.	Remarks.
1	Ransome ½	6 x 6	12	12,100	0.25	504	48,400	Concrete split longitudinally
4	Ransome ½	8 x 8	12	8,300	0.25	346	33,200	Rod slipped at 8,000, dropped to 6,000, rose again to 8,300, where concrete split. Rod pulled through 3 in.
13	Thacher ½	6 x 6	12	4,850	0.18	270	26,900	Rod slipped and concrete split
22	Johnson ½	6 x 6	12	12,200	0.14	678	87,200	Concrete split
[illegible]	Ransome ½	6 x 6	16	8,100	0.25	253	32,400	Concrete split longitudinally
5	Ransome ½	8 x 8	16	14,000	0.25	438	56,000	Rod slipped at 12,000, dropped to 8,000, rose again to 14,000, where concrete split. Rod pulled through 5 in.
14	Thacher ½	6 x 6	16	8,200	0.18	340	45,500	Rod slipped at 8,100, concrete split
23	Johnson ½	6 x 6	16	13,120	0.14	545	93,700	Concrete split
3	Ransome ½	6 x 6	26	16,800	0.25	323	67,200	Concrete crushed on end
6	Ransome ½	8 x 8	26	15,000	0.25	288	60,000	Rod slipped at 15,000, rod pulled through, max. stress 14,400. Rod pulled through 11½ in.
15	Thacher ½	6 x 6	26	10,550	0.18	272	58,600	Rod broke
24	Johnson ½	6 x 6	26	13,750	0.14	354	98,400	Rod broke
7	Ransome ¾	8 x 8	20	25,900	0.56	431	46,300	Rod slipped at 18,000, concrete split
16	Thacher ¾	8 x 8	20	21,150	0.39	478	53,000	Rod slipped at 19,050, concrete split
25	Johnson ¾	8 x 8	20	27,600	0.31	619	89,100	Concrete split
8	Ransome ¾	8 x 8	24	31,900	0.56	443	57,000	Rod slipped at 14,000, concrete split
17	Thacher ¾	8 x 8	24	18,300	0.39	344	45,900	Concrete split
26	Johnson ¾	8 x 8	24	25,000	0.31	467	80,600	Concrete split
31	¾ round	8 x 8	24	15,300	0.44	271	38,400	Rod slipped
34	¾ square	8 x 8	24	19,700	0.56	274	35,200	Rod slipped
37	1⅛ x ½	8 x 8	24	12,400	0.56	159	22,100	Rod slipped
40	1½ x ⅜	8 x 8	24	20,300	0.56	226	36,300	Rod slipped
43	2¼ x ¼	8 x 8	24	5,000	0.56	42	8,930	Rod slipped (specimen injured)
32	¾ round	8 x 8	31	18,600	0.44	255	42,200	Rod slipped
35	¾ square	8 x 8	31	22,600	0.56	243	40,400	Rod slipped
38	1⅛ x ½	8 x 8	31	20,300	0.56	201	36,200	Rod slipped
41	1½ x ⅜	8 x 8	31	21,700	0.56	188	38,800	Rod slipped
44	2¼ x ¼	8 x 8	31	25,500	0.56	165	45,500	Rod slipped
9	Ransome ¾	8 x 8	36	36,600	0.56	339	63,500	Concrete split
18	Thacher ¾	8 x 8	36	23,700	0.39	297	59,400	Rod broke
27	Johnson ¾	8 x 8	36	28,000	0.31	483	90,500	Concrete split
33	¾ round	8 x 8	36	18,600	0.44	219	42,200	Rod slipped
36	¾ square	8 x 8	36	23,900	0.56	221	42,700	Rod slipped
39	1⅛ x ½	8 x 8	36	21,700	0.56	185	38,700	Rod slipped
42	1½ x ⅜	8 x 8	36	22,130	0.56	164	39,500	Rod slipped
45	2¼ x ¼	8 x 8	36	26,100	0.56	145	46,600	Rod slipped
10	Ransome 1⅛	10 x 10	27	33,100	1.27	273	26,100	Concrete split
19	Thacher 1⅛	10 x 10	27	28,100	1.03	288	27,300	Concrete split
28	Johnson 1¼	10 x 10	27	40,100	1.00	371	40,100	Rod slipped, concrete split
11	Ransome 1⅛	10 x 10	37	26,150	1.27	157	20,600	Rod slipped at 24,000, concrete split
20	Thacher 1⅛	10 x 10	37	48,950	1.03	367	47,500	Concrete split
29	Johnson 1¼	10 x 10	37	44,200	1.00	300	44,200	Rod slipped, concrete split
12	Ransome 1⅛	10 x 10	50	34,600	1.27	153	27,200	Concrete split
21	Thacher 1⅛	10 x 10	50	58,450	1.03	324	56,700	Concrete split
30	Johnson 1¼	10 x 10	50	57,250	1.00	286	57,250	Rod slipped, concrete split

State Regulation and Taxation of Railroads.

The Interstate Commerce Commission announces the completion of Parts IV and V of an appendix to its 16th annual report containing matter on the above subjects.

Part IV embraces a compilation of State statutes on the organization, control, and administration of railroads. This compilation shows the situation as it existed in 1890, and all changes which have taken place from that date up to the adjournment of the State Legislatures in 1902. It is in the form of tables, which are so drawn as to permit one to learn quickly what the facts are relative to any particular phase of railroad regulation.

The number of States which in 1902 exercised control through commissions was 30. Six States which in 1890 were without commissions established them during the period, of which two were subsequently abolished; four States which in 1890 had commissions abolished them, but in two instances subsequently re-established them. In the case of two States, however, the abolition of railroad commissions does not indicate a disposition to relieve railroads from public control. On the contrary, the purpose was to clear the way for the organization of a system of control believed to be more efficient than that of railroad commissions.

State railroad commissions are of two general classes, the "weak commissions" and the "strong commissions"; the former including those which do not have control over passenger and freight rates, the latter those which do have power to control. Of the 28 commissions in existence in 1890, 15 were strong and 13 were weak; of the 30 commissions existing in 1902, 20 were strong and 10 were weak. No State which in 1890 was clothed with the power to regulate rates has lost that power.

There is a tendency toward an extension of the regulative power of commissions over street railroads, over steamboat companies, express companies, telegraph companies, telephone companies, transportation companies, fast-freight companies, railroad-bridge companies, railroad-tunnel companies, railroad-ferry companies, warehouses, union-depot companies, car companies, sleeping-car companies, and harbor companies. There are 72 cases of control by State railroad commissions over agencies of transportation other than railroads, as against 41 in 1890.

A change is noted in the method of appointing commissioners. In 1890, 18 were appointed by the Governors of the States, as against 13 in 1902; six were elected by the people in 1890, as against 15 in 1902; and two were appointed by the Legislature in 1890, as against one in 1902. The salaries paid railroad commissioners range from $1,200 in North Dakota to $8,000 in the State of New York. The typical salary for a railroad commissioner is perhaps $3,000.

The tendency in legislation during the 12 years subsequent to 1890 is clearly in favor of the more strenuous form of control. Thus, in the case of both passenger and freight rates, 13 commissions in 1902 are authorized to make general schedules as against seven in 1890. The power to make joint rates has been slightly increased, this power, so far as freight rates are concerned, being conferred upon the commissions of nine States in 1902 as against five States in 1890.

In 1902, 41 States provided for incorporation under general railroad law, as against 38 in 1890. Laws have been enacted modifying and extending the character of public regulation since 1890 in 467 particulars. Of these 73 pertain to right of way, 94 to railroad crossings, 126 to the movement of trains, etc. These are mostly an exercise of the police powers of the State. The law establishing the Court of Visitation in Kansas in 1898 aimed to combine administrative and judicial functions. In 1900 it was declared void on the ground that in it the "legislative, judicial, and administrative powers are so inextricably interwoven as to render their separation impossible." The Virginia Corporation Commission, which came into active existence March 1, 1903, is empowered to supervise all corporations.

Part V is a compilation of State statutes relative to taxation. Railroads contribute annually in excess of $50,000,000 to the support of government, but there is confusion and uncertainty attending the levy and collection of this tax. To the railroads this confusion and uncertainty means the exposure to double taxation; to the agencies of government it means liability to tax evasion.

This report has three tables: The first shows in a general way the kinds of taxes used by each State; the second presents an analysis of statutory provisions for the administration of the law of taxation; the third presents an analysis of statutory provisions for reports relative to taxation required from railroads and allied transportation agencies. These tables are followed by a text which describes in detail the taxing system of each State, so far as it pertains to agencies of transportation. This text presents, first, the constitutional provisions of each State; second, the law as it stood in 1890; and third, the changes to and including 1902.

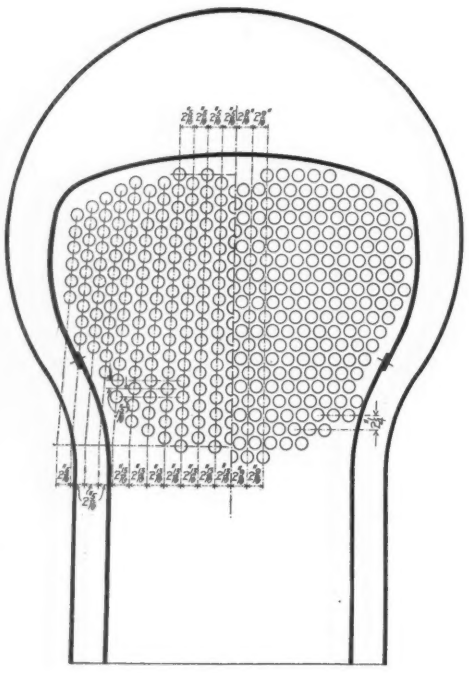
The general fact is that railroad property is taxed on the basis of valuation. The special rules refer rather to the assessment, the levy, and the collection of the tax than to theory or general principles. In 1890 it was commonly said that the tendency was toward the substitution of taxes on gross or net earnings, or on dividends or some other feature of special taxation, for taxation based on valuation. A review of the tax laws in 1902 does not warrant such a statement at the present time. There seems to be no tendency during the past 12 years toward

the abandonment of the theory of the general property tax, so far as railroads are concerned.

The changes which have taken place since 1890 refer rather to methods of valuation and to the machinery of administration; they also indicate many experiments in the apportionment of the proceeds between the States and the minor civil divisions. . . .

Wide Flue Spacing on the Minneapolis & St. Louis.

In view of the attention that is being given to the matter of wider spacing of flues as one remedy for locomotive boiler troubles, the practice that has been followed for a number of years by Mr. John Tonge, Master Mechanic of the Minneapolis & St. Louis, is of special interest at this time. In the accompanying engraving the right-hand half shows the old method of tube spacing on Mogul (2-6-0) locomotives on that road, and the left-hand half shows the present arrangement. The total number of tubes by the former is 378, and by the latter is 316, a reduction of 62, or 16.4 per cent. An important advantage of the changed method is the greater space provided between flange and tubes. This increased space on the flue-sheet gives material sufficient to provide the requisite stiffness to prevent the adjacent holes from becoming



Present and Former Method of Spacing Flues in 2-6-0 Locomotives on the Minneapolis & St. Louis.

oval; a trouble that in the old arrangement became greater with each rolling of the flues.

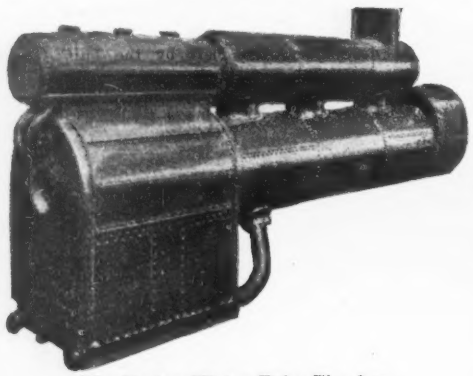
In the new arrangement the center row of tubes is vertical and the successive rows on each side are spaced $2\frac{5}{16}$ in. apart at the top and $2\frac{13}{16}$ in. at the bottom for all except the last five rows, which are parallel. The object in increasing the spacing going downward is to provide ample space for scale and sediment falling from the tubes to find their way to the bottom. The old method, in which the rows are horizontal, with a staggered arrangement vertically, offers obstructions to the falling scale or sediment, accumulating it on the lower tubes.

The method of procedure in setting the flues is to roll in the four or five diagonal rows at the upper right and left-hand corners first; then the central section; and lastly those at the bottom. By this method the holes in the corners remain perfectly round instead of becoming oval. After rolling, the tubes are sectioned with a Prosser expander. By thus reversing the usual practice with roller and expander it is claimed that the tubes remain tight three times as long.

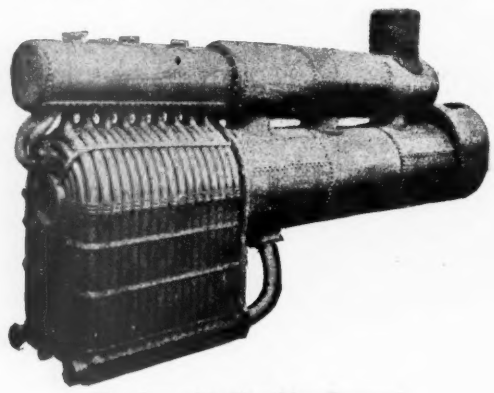
The Brotan Water Tube Fire-Box.

The latest contribution to the solution of the staybolt problem is the water tube fire-box designed by Mr. Johann Brotan. The boiler illustrated was applied to a six-coupled goods engine which went into service on the Austrian State Railway in January, 1901.

The general construction is obvious from the illustrations.



The Brotan Water Tube Fire-box.



Fire-box with Sheathing Removed.

Water Glasses for Locomotive Boilers.*

On the question whether the water glass is a valuable appliance on a locomotive there is quite a diversity of opinion. The general conclusions are that a water-glass is a necessary adjunct to a locomotive. When the different opinions are analyzed it is noted that those who object to the water-glass are working with comparatively pure water that has no alkali in it, or any substance that will cause foaming and where very little soda ash is used. Engineers who have good water and are on engines of the wide fire-box type where there is little room for the engineer at any time, and not enough room at the instant when a glass bursts, object to the glass, as the gage-cocks answer the purpose fully.

On an eastern road using wide fire-boxes there is a decided objection to water-glasses. They are considered dangerous on account of injuring the men in the cab when they burst. In cases where the boilers have been scorched, a deceptive water level shown by the glass has been assigned as the cause. Then they are found to be expensive and the annual cost of maintenance foots up a large sum. The round water-glass tube is used.

There is an objection to the water-glass that is not confined to the enginemen, the locomotive department officials laying great stress on it. An engineman may be deceived when a water-glass gets out of order, either by partially or wholly closing the cocks, so that it will indicate a false water level, and he will think he has plenty of water till he finds out when too late that the water does not cover the crown-sheet. We cannot see why this should condemn the appliance, unless we take the ground, as is sometimes done, that the use of a water-glass is a temptation to be careless.

The danger to the occupants of the cab when a glass bursts is the most serious objection to their use. In this connection we should make a distinction between glasses that break from being put in wrong and those that break from weakness due to internal corrosion. If the cocks and mountings are in line and proper gaskets are used so that the glass tube can be put in without any strain on it, very few new glasses will break. A road foreman of engines in the alkali country of California says: "With ordinary care a glass that has lived its usefulness can be detected at a glance. It will look streaked and appear to have numerous small flaws in the upper end. On engines carrying over 180 lbs. the glasses should be changed every 30 days, which will do away with a large percentage of explosions."

There are a number of devices to automatically shut off the steam and water from a bursted glass. When these devices are new and working in clean water they will operate as expected, but when the parts get incrusted with scale or clogged with mud they are useless. To prevent the pieces of a bursting glass striking the men in the cab various kinds of guards are used. The device should be so made as to be easily taken off and replaced when cleaning is necessary.

As to the economy of a water-glass in connection with fuel consumption there is but one opinion among those who have been close observers; and that is, that a fireman can fire closer to the economical mark if he can tell at all times where the water level is, and whether it is going up or down in the boiler. If he can tell this by inspection of the glass while firing, this information coupled with his knowledge of the grades and how the engineer is likely to work the engine, will give him a good idea as to whether a heavy or light fire is necessary. If the fireman does not know whether the boiler is full of water or not, he must keep a heavy fire to be ready to hold up steam against an injector full on, when possibly a light fire might do the work. This applies particularly to soft coal firing.

In the alkali-water country, or where they use soda ash (which takes in a good share of the territory west of the Mississippi River), we find the strongest advocates of the water-glass. One of the peculiarities of alkali water is that when working the engine the water follows the steam up as spray or foam, so that the true water level may be way below the apparent level as shown by the gage-cocks, and the true level is more certainly shown by the glass than the cocks. With the engine working, water may show at the top gage-cock just as solid as it does at the bottom one; the glass shows nearer the true level than either.

Remarking that much of the trouble had in taking care of water-glasses arises from a lack of knowledge and interest in the proper way to do the work, the paper gives numerous points to be observed in their application and care.

It is a curious fact that if the steam supply to the top end of the water-glass comes through a moderate-sized copper pipe from a globe valve located on top of the boiler, 18 in. or more from the top of the glass, instead of coming directly into the glass through the top mounting, the glass will last much longer; the glass does not corrode or get eaten away as soon as where the steam connection is direct through the cock. In many cases where these extra pipes and cocks are applied to the old-style mountings the life of the glasses has been materially increased. Always connect both ends of the water-glass to the boiler; do not connect to the turret or any place from which the steam can be shut off.

The reflex water-glass is described. In further reference to it the paper says: The action of the light reflected through the fluted glass on the steam shows white, while where the water is it shows black. Thus there is no mistake in locating the water level shown in the glass or knowing whether the glass is full or empty. In addition to showing the water in this manner, when this flat glass breaks from steam pressure it does not fly to pieces and injure the men as the round one does. The pieces seem to wedge together and rarely come out till the case is taken apart. In some cases the glass has been found to last longer if it is reversed, case and all, about once in 10 days.

*Extracts from a paper before the Traveling Engineers' Association, by Clinton B. Conger.

Advance sheets of the full Russian railroad report for 1901 show that in that year there were 9,890 accidents causing death, injury or material loss. Among these accidents were 1,012 collisions and 1,521 derailments. Misplaced switches alone caused 184 collisions and 458 derailments. By these accidents 1,490 people were killed and 3,757 injured; 103 of the killed and 682 of the injured were passengers; 506 killed and 2,053 injured were employees. As 881 killed and 1,022 injured were "other persons," we may assume that persons struck while walking or standing on the track are included, and not victims of train accidents alone. Yet as Russia has but one-seventh the railroad mileage of this country it looks as if our pre-eminence in this regard must be resigned.

TECHNICAL.

Manufacturing and Business.

The New York Central has re-opened its car repair shops at Lyons, N. Y., which have been closed for a number of years.

The Archer-Foster Construction Co., of Fort Smith, Ark., has been incorporated with a capital of $10,000 to build railroads, bridges, etc.

The American Train-Stop Company, of San Francisco, has been incorporated in Delaware to manufacture appliances for stopping cars; capital, $100,000.

The White-Warner Company of Taunton, Mass., will make additions to and in future be located at the Taunton Iron Works, which it bought soon after the destruction of its foundry by fire.

The Southern Car & Foundry Company has resumed operations at its Gadsden, Ala., plant after an idleness of about six weeks. Work is now progressing on the contract with the Queen & Crescent for repairs of 600 freight cars.

The McGovern Construction Company has been incorporated by Geo. Pfeiffer, Jr., of Camden, N. J., and Wm. F. McGovern and Benj. Godshalk, of Trenton, N. J., with a capital stock of $50,000, to conduct a general construction business.

The Wabash Bridge & Iron Co., Wabash, Ind., for which a receiver has been appointed by reason of the action taken by The Central Trust Co., of Cleveland, and Wabash creditors, has $275,000 liabilities and $87,000 assets as shown by the receiver's report.

The Sea Shore Bridge Company has been incorporated with a capital stock of $100,000, to do a general bridge building business, by Robt. P. Brown and T. Fernley Brooks, of Philadelphia, and Archelaus P. Willits and Jos. B. Willits, of North Beach Haven, N. J.

The Magnolia Metal Co. announces that it has moved back to its factory at 113-115 Bank street, New York City, which was destroyed by fire about a year ago, and which has been rebuilt and equipped with modern conveniences for making all grades of babbitt metal.

The International Air-Brake & Steam Connection Company has been incorporated in New Jersey, with a capital of $5,000,000, to manufacture air-brakes, signals and other railroad equipment. The incorporators are Horace H. Dall, Richard B. Hainton and James Neil, Jr.

Albert Ladd Colby, for the past ten years metallurgical engineer of the Bethlehem Steel Company, is now Assistant to the President of the Orford Copper Company, 74 Broadway, New York, which controls the International Nickel Company. Mr. Colby's duties will be chiefly in connection with the manufacture and applications of nickel steel.

Thornton N. Motley has resigned as President and as a Director of the Thornton N. Motley Co., 12 John street, and has associated with him Mr. W. Ross Gravener, formerly with the Plant System of Railways in the South. Mr. Thornton N. Motley will continue in the railroad specialty line and supply business at the same address. Mr. Motley has been located in John street since 1879.

Howard W. White & Company, Old Colony Building, Chicago, report sales of over 5,000 tons of metal during the month of July. This concern handles all kinds of metal sheets, fire-box and tank steel, boiler tubes, tool steel, hydraulic tools and machinery, and a great variety of special machinery and tools for railroads. The company contemplates building a large warehouse in Chicago.

Iron and Steel.

The Birmingham Drop Forge & Machine Co. has bought land at Bessemer, Ala., and work on its new plant at that place will soon begin.

The Republic Iron & Steel Co.'s 8-in. mill at Toledo, Ohio, has resumed operations after long idleness; the 10 and 18-in. mills are being repaired.

The Cambria Steel Company, of Johnstown, Pa., has Government orders for a large amount of nickel steel; also steel frames for the Navy Department.

The American Steel & Wire Co. finds trade as good as a year ago for both foreign and domestic. Orders for September are much more numerous than heretofore.

The Liggett Spring & Axle Co. expects to have its new plant at Axleton, on the Monongahela River, in operation early next month. The machinery is being removed from the plant at Allegheny, which will be closed.

Engineers' Club of Philadelphia.

A business meeting of the club will be held Saturday, Sept. 19, at 8 o'clock p.m. The results of the vote for election of new members will be announced and Henry Leffmann will read a paper on "The Borderland of Biology and Engineering."

M. M. Association Scholarship.

The Executive Committee of the American Railway Master Mechanics' Association has awarded the Joseph T. Ryerson & Son Scholarship in Purdue University to Arthur B. Marsh, of Boston. The committee, W. H. Lewis, P. H. Peck, and J. W. Taylor, met at Purdue and reviewed the results of the examinations. There were 17 candidates.

New Naval Ships.

The armored cruiser "Maryland" was launched from the yards of the Newport News Ship Building & Dry Dock Co., at Newport News, Va., on Sept. 12. The "Maryland" is a sister ship to the "West Virginia" and the "Pennsylvania," and to the "California," "Colorado" and "South Dakota," now building. The "Maryland" is about 60 per cent. completed. The monitor "Wyoming," built by the Union Iron Works, of San Francisco, having met the requirements of her contract, has been finally accepted by the Government.

"Motley, Green & Company."

On the 15th instant, the company heretofore doing business as the "Thornton N. Motley Company," and which has been a factor in the railroad equipment and supply trade for many years past, changed its name to Motley, Green & Company, and continues to do business under that name, with the following officers: James M. Motley, President; Ashbel Green, Vice-President and Treasurer; W. W. Caldwell, Secretary. This change was brought about by the fact that Mr. Thornton N. Motley, whose name the company bore, resigned his position as President and Director, and disposed of his interest in the company to its present officers a few weeks ago, in order to enable him to give closer personal attention to the specialty agencies of large manufacturers in this country. Motley, Green & Company retain all of the good will, and the plant and equipment of the Thornton N. Motley Company, and continue to do business at the same address, 12 John street, New York, giving their attention to the general trade, more especially cars, locomotives, machine tools and rails, both for export and domestic markets.

American Steel Foundries Company.

At the annual meeting of the directors of this company on Sept. 15, the following directors were elected: Those whose terms expire in 1904, E. B. Thomas, W. C. Brown, C. H. Howard, E. F. Goltra, W. D. Sargent, A. J. Eddy and Lewis Nixon. Those whose terms expire in 1905, J. E. Schwab, Daniel Eagan, G. B. Leighton, W. K. Bixby, Max Pam, L. D. Ward and Edward Shearson. Those whose terms expire in 1906, E. H. Gary, Chas. M. Schwab, Alfred Clifford, C. A. Miller, J. M. Schoonmaker, S. R. Callaway and Geo. L. Peabody. The following officers were re-elected: J. E. Schwab, President; Daniel Eagan, First Vice-President; C. H. Howard, Second Vice-President; F. E. Patterson, Secretary and Treasurer, and Max Pam, General Counsel. The executive committee was also re-elected, with the exception that Chas. M. Schwab was chosen to succeed Clarence H. Howard.

Train Lighting with Storage Batteries.

The Pennsylvania has ordered a set of Edison's new storage batteries for experimental use. They will be compared with storage batteries of other makes now in use on a few cars on the company's lines. About a year ago Mr. Theo. N. Ely, Chief of Motive Power, took up the matter with Mr. Edison, having in mind the use of the batteries as a solution of the problem of train lighting. Mr. Edison recently advised him that the development of the battery had reached such a stage that he was prepared to have an investigation made of it and the order for the experimental set followed.

Taylor Interlocking.

Following is a partial list of Taylor "all electric" interlocking plants, now in course of construction.

Place.	Railroad.	Size of machine (lever spaces).
Toledo, Ohio	T. R. & T. C.	48
Allegheny, Pa.	Penna. West of Pittsburg	72
Monongahela, Pa.	Penna. West of Pittsburg	48
Portage Lake, Mich.	Copper Range	40
San Bruno, Cal.	Southern Pacific	20
Clement Junction, Cal.	Southern Pacific	20
Milano, Tex.	G., C. & Santa Fe	20
Chillicothe, Ill.	Atchison, T. & Santa Fe	8
Dallas, Tex.	G., C. & Santa Fe	20
Bay View, N. Y.	Lake Shore & M. S.	24
Gilman, Ill.	Illinois Central	56
Waldwick, N. J.	Erie	48
Ridgewood, N. J.	Erie	56
Mahoning, Pa.	Lehigh Valley	24
Lehighton, Pa.	Lehigh Valley	40
Allentown, Pa.	Lehigh Valley	72
Oakdale, Tenn.	Cincinnati, N. O. & T. P.	12
St. Joseph, Mich.	Pere Marquette	8
Jackson, Mich.	Michigan Central	24
Lake Bluff, Ill.	Chicago & North Western	32
Peterson avenue, Chicago, Ill.	Chicago & N. W.	28
West Seneca, N. Y.	L. S. & M. S.	48
Lake View, N. Y.	L. S. & M. S.	24
North East, Pa.	L. S. & M. S.	8
Saybrook, Ohio	L. S. & M. S.	8
South Lansing, Mich.	Grand Trunk	52
Watervliet, N. Y.	Delaware & Hudson	40
Patterson Creek, W. Va.	Baltimore & Ohio	48
Nottingham	L. S. & M. S.	24
Wickliffe	L. S. & M. S.	24
West End, Ashtabula, Ohio	L. S. & M. S.	24
Lake Shore Junction	Chicago & North Western	28

Interlocking Contracts.

The power interlocking to be put in by the New York Central at South Schenectady is to be "all-electric" and not low pressure pneumatic, as was made to appear in an item published in this column last week. A corrected list of contracts recently taken by the Pneumatic Signal Company, including a number not mentioned last week, shows 322 levers, as below.

	Levers.	Spare spaces.
N. Y. C.—E. Rochester. Low-press pneumatic	41	..
N. Y. C.—E. Rochester, Low-press. pneumatic	37	..
N. Y. C.—So. Schenectady, All-electric	45	..
Erie—Smithboro, Manual	14	6
Erie—Lordville, Manual	26	2
Erie—Canisteo, Manual	17	3
Erie—Canaseraga, Manual	16	4
Erie—Campville, Manual	18	2
Indiana Harbor R. R.—Ind. Harbor, All-elec.	60	28
C., M. & St. Paul—Newport, Manual	48	8

Interlocking.

The Chicago & Eastern Illinois is to put in interlocking switches and signals, with a machine of 44 levers, at St. Joseph, Ill., where the line crosses the Peoria & Eastern and the Danville, Urbana & Champaign electric road.

The Gulf, Colorado & Santa Fe and the Missouri, Kansas City & Texas have just put in use interlocking signals at the crossing of the two roads at Temple, Texas.

Locomotive Front-End Details.

The committee which was appointed last year by the Traveling Engineers' Association to recommend a front-end arrangement, after a year's experiment has sent out circulars but has got few responses and no original suggestions; the committee therefore makes a report now to the association but has no recommendations to make. The report describes the experiments conducted by the Michigan Central with the Master Mechanics' arrangement, and the results obtained. Drawings are given of front-end arrangements for different classes of locomotives on that road. The report says further that the idea that the steam-jet from the exhaust nozzle must fill the smoke-stack is most thoroughly exploded. As a matter of fact, when these engines are being forced at high speed on a cold day and the fire is burning brightly, the steam-jet appears not more than 8 in. in diameter, and passing directly up the center, leaves a vacancy of 5 in. from all sids of stack, showing absolutely nothing else as escaping except when fresh fire is added.

In conclusion the committee would say that so far as a new design of front-end is concerned, we believe that little improvement can be made over designs already in successful use. The best designed front-end that is possible will not prove satisfactory unless surrounded by proper conditions, such as freedom from steam leaks in front-end, air leaks in smoke-arch, and improper alignment of nozzle, petticoat-pipe and smoke-stack. We further wish to emphasize our opinion that satisfactory adjustment of the front-ends of modern power is impossible unless the netting area is large in proportion to the working capacity of the locomotive in which it is placed; and, further, that any restriction of the netting area below an area equal to that of a square of the diameter of the smoke-arch is a detriment.

This report is signed by F. McArdle, Chairman; J. W. Hardy, G. W. Wildin, W. H. Corbett, J. D. Benjamin.

Main Check Valve Above the Water Line.

This subject was assigned to a committee of the Traveling Engineers' Association for report, and has reference to placing the main check valve above the water line where the feed-water contains lime; also to the best method of removing scale from injectors, injector tubes, etc. The committee does not think there is any advantage gained in putting the check above the water line; the inflowing water would condense the steam, and the resistance to the inflow of the water decreases as the distance below the steam line increases.

To clean carbonate scale from injector tubes a half-and-half mixture of muriatic acid and water is effective. The parts should be put in oil as soon as removed from the acid.

Sulphate of lime scale is little affected by acids. Kerosene oil tends to loosen the scale, its action being helped by heat. But no very satisfactory method is known, and the water should be treated before using.

The effect upon injectors of scale-bearing water differs with the design and the construction of the overflow chamber. Owing to the high temperature of the feed-water passing through the tubes, and the strong vacuum in the overflow chamber at high steam pressure, evaporation takes place in and around the tubes of the injector, which causes a heavy deposit of scale, because the temperature of the feed-water is above that of boiling at the pressure in the overflow chamber. This has been corrected in certain designs by admitting cold feed-water directly from the water supply chamber to the overflow chamber, reducing the temperature of the feed-water below the point at which the precipitation of scale occurs and at the same time increasing the pressure within the overflow chamber nearly to that of the atmosphere. Tests made of the application of this improvement have shown a reduction of scale amounting to more than 50 per cent., increasing the length of service of the injector and materially reducing the cost of maintenance and repair.

The report is signed by F. T. Bowles, Chairman; J. N. Hart, Wm. Doze, A. J. McKillop, S. L. Kneass.

The Brick Arch in Locomotive Fire-Boxes.

The information contained in the committee report to the Traveling Engineers' Association on the brick arch in locomotives burning bituminous coal in deep, shallow and wide fire-boxes was compiled from replies to a list of 19 questions sent out to members of the association. On lines where bituminous coal is used the arch is considered a powerful adjunct in steam-making and economy. Some members state that the arch should equal 33 per cent. of the grate area, others 66 per cent. The top of the first arch brick next to the flue-sheet should be level with the bottom row of flues and set 5 or 6 in. back of the flue-sheet to prevent filling up on top of the arch. There is no advantage in leaving space between the ends of the brick and the side-sheets.

When the draft appliances are adjusted to obtain the best results, with an engine equipped with an arch, and the arch is removed, necessary changes should be made in the diaphragm or draft appliances to produce an even draft on the flues without an arch. Usually the plate is lowered to accomplish this result. It is not claimed that an engine can be drafted to give a more economical performance without an arch than with one.

All claim that the arch will assist in reducing black smoke. In good water localities, and where there would be sufficient time at terminals to clean off the grates, bore out and chalk flues and do necessary fire-box work the committee favors the use of the arch. In poor or bad water localities, where engines have short time at terminals, the arch is more of a detriment than an advantage, as the flues become stopped up and the flue-sheet will honey-comb behind the arch. The height of the arch above the grate will range from 16 to 22 in. In the wide fire-boxes the arch is supported by tubes which interfere with boilermakers working in the fire-box.

The committee believes that from a standpoint of economy in dollars and cents, on shallow and wide fire-box engines the arch is not a benefit, except where work can be done properly and conditions will warrant its use.

The report is signed by W. G. Wallace, N. M. Maine, A. S. Erskine, J. F. Cosgrove, J. J. Gill.

Painting and Maintaining a Locomotive.*

It is impossible to make an iron-clad rule or system for painting a locomotive in a repair shop, owing to the variety of conditions which prevail when an engine reaches the shop, but the following method has been used with success in our shop.

First day.—The tank is washed with a strong solution of potash, followed by scraping with broad 3-in. knives and then thoroughly rinsing with water. A primer composed of Prince's mineral brown, mixed to a paste with two-thirds rubbing varnish and one-third boiled oil, thinned with turpentine, is then applied.

Second day.—Puttied, and a coat of glazing lead knifed on.

Third day.—The edges left by the knife are sandpapered, which takes a man about 1½ hours. If the tank work is in advance of the engine, we extend the time, and give the tank two coats of engine finish in place of one coat of flat black; but ordinarily a coat of black and one coat of engine finish is applied.

Fourth day.—Lettered and varnished.

Fifth day.—Finishing varnish.

The classification of labor helps to simplify and economize the work. Each man should be kept at a certain class of work in order that poor work can be properly charged. It also prevents men from running around the shop looking for a new job.

Proper care of the paint and varnish after its appli-

*Abstract of a paper before the Master Painters' Association, by A. P. Dane, Boston & Maine R. R.

cation is important. Apparently either the proper cleaner or the proper management of this branch has not been found. This branch should be placed either in charge of the foreman painter, or one who understands the nature of varnish, and who will use a cleaner that is a feeder to varnish, and not a feeder of it.

No reputable varnish maker will guarantee his best varnish to hold its gloss, or retain its surface intact, longer than a year. Inasmuch as cars receive attention every year, it is necessary that locomotives receive like attention.

Train Orders and Train Signals for Interurban Railroads.*

The first and paramount consideration in the operation of any high speed suburban or interurban electric road must be the safety of passengers and trains. To this element all others must be subserved even at the expense of the prescribed schedules, but it must be clearly borne in mind also that complete safety is dependent very largely upon the maintaining of schedules and the regularity and punctuality with which trains move. Rules and regulations that are drawn so conservatively as to interfere needlessly with the movement of trains may very easily introduce a new element of danger. . . .

There are two methods of transmitting messages from the despatcher to the operators along the line, the telephone and the telegraph. It is true that most steam roads use the telegraph and most electric roads use the telephone for despatching purposes and for electric railroad operation, opinion appears to be divided as regards the relative merits of the two systems. There is little to choose between the two; either one will prove adequate if properly installed and properly maintained. The cost of wire and instruments of either system will be about the same and either is liable to disarrangement if not properly watched, although the telephone is perhaps more susceptible to disturbing influences than the telegraph. With either system it is desirable to have operators at every regular meeting place to receive and record messages, or in lieu of operators, at least some method of recording and checking messages.

. . . The International Railway Co. does not use flags as markers. It has been observed that when a train is running at speed, the movement causes the flags to hang straight to the rear, consequently, they are not plainly discernible by the crew of an opposing train. In place of flags a metal dash sign is used, these signs being about 8 in. x 8 in. They have been found very satisfactory.

Safety, regularity and punctuality do not depend so much upon the methods of despatching, or the rules adopted for the management of employes, as they do upon the way in which the rules are observed by every individual in the organization from the manager down to the switch boy. An indifferent set of rules rigidly and consistently enforced and observed is far better than the best code of regulations, half-heartedly or inconsistently enforced. The operating organization is a complicated machine and each individual cog must fit into its allotted place and perform its allotted functions. A rigid, never ceasing, never relenting inspection of every cog is the first requisite to efficient and safe operation.

THE SCRAP HEAP.

Notes.

Press despatches from Chicago say that the advance in grain rates to the Atlantic seaboard, announced a week ago, is not to be put into effect before November 1.

On Saturday, September 5, the Philadelphia & Reading carried 12,229 passengers to Willow Grove, a few miles from Philadelphia. On the Sunday following 45,069 were carried.

In the shops of the Pennsylvania Railroad at Altoona, and of the Philadelphia & Reading, at Reading, the time of the employees has been increased. At Altoona the men will, on four days in the week, work 13 hours a day; at Reading the time is 13¼ hours, six days in the week.

The Railroad Commissioners of Texas have issued a tariff, to go into effect October 5, under which the express companies of the State will be required to reduce their rates about 10 per cent. The companies had intended to make a small advance, and they are likely to test the commissioners' authority by an appeal to the courts.

The railroads of Virginia, according to the newspapers of that State, are preparing to resist the enforcement of the rules which have been promulgated by the Corporation Commission regulating demurrage and storage charges, and imposing a penalty, similar to that which has been prescribed in North Carolina, on carriers for delays in the transportation of freight.

The trunk lines have agreed to make a reduction on export grain from Buffalo and Erie to the seaboard of 1 cent a bushel. The new rates go into effect on September 15 and continue until October 15. Grain exporters in Philadelphia, New York and Baltimore have been complaining for some time that the bulk of the grain carried over the lakes recently has been taken to Montreal. The exports from that port during the last few months has been the greatest in its history.

The Magnates and the Toiling Millions.

Before the Omaha Commercial Club, at an appropriate time after dinner, Mr. Albert Stickney discussed "undigested securities": At a price, the digestive ability of 80,000,000 of people cannot be measured. The transfer books of the large corporations prove that digestion of small lots has already commenced by the unknown public, who are the final digesters. The process continued will relieve the impaired digestive organs of those ambitious magnates "who have bitten off more than they can chew." "The powers that be" has been a favorite designation for a few cliques of rich speculators. But history has proven over and over again that "the powers that be" are not the magnates, but the millions. Who achieved the balance of trade and turned the stream of the golden fetich towards this country after the panic of '93? Was it the magnate with his plethora of stocks and bonds, or with his faith-cure syndicates making "exchange transactions"? No, it was not the magnate, but it was the humble millions toiling on the isolated farms. It was the exportation of grain, and cotton, and cattle, and the inexpressible hog.

Comparative Value of Iron Mines and Hens' Nests.

Mr. Albert Stickney, President of the Chicago Great Western, divulged the economic value of the hen at an after-dinner speech in Omaha:

A short time since, I had the pleasure of visiting the iron ranges of Minnesota. The whole train carrying our party was literally backed into one of the great iron mines. In that single mine were seven other railroad trains, and seven huge steam shovels, each making two dips per minute, and at each dip loading three tons of iron ore into those seven trains of cars. The magnitude of the production of a single mine makes the production of a single farm appear indeed insignificant. But the prosperity of a market-town relates, not to the magnitude of the production of a single farm, or a single mine, but to the aggregate production within its territory. From this point of view, I ascertained the annual production of all the mines in the largest iron-producing territory in the United States, and to my astonishment I found that the value of the entire annual production of all the iron mines in Minnesota is less than the value of the annual product of the hens, the common barn-yard fowl, of the magnificent agricultural State of Iowa.

The Lesson of the Newark Collision.

[*Letter from Mr. Clemens Herschel in the Newark News.*]

In 1869 the Massachusetts Railroad Commission was instituted, the first in the United States, but since copied by many, or most, of the States of the Union. Experience has shown that such commissions do very important and good work in the community, merely by reason of the power given them to send for persons and papers. Two corporation officials jockeying each other, each standing out for what he conceives to be the rights of his company, meanwhile allowing the public interests and the public safety to suffer, are speedily made to come to an agreement and to see to it that the public interests are safeguarded, by the simple expedient of calling them both to the office of the commission and then forcing them to listen to each other and to reason.

I will state as my firm conviction, based on a three years' experience in service as railroad commissioner in Massachusetts, that such a dispute as this between the two officials of the trolley company and the Lackawanna Company, respectively, which prevented the proper safeguarding of the Clifton avenue grade crossing, would certainly have been speedily settled, and the accident prevented, by the existence of a railroad commission in the State of New Jersey.

Two courses which may be taken as alternatives, or in combination, are therefore open to the people of the State of New Jersey if they want to render impossible such slaughter pens as unprotected or insufficiently guarded trolley and railroad grade crossings, besides acquiring the many other benefits which a railroad commission would give them.

They can pass a statute creating such a commission in spite of ill-judged opposition from railroad lawyers and lobbyists; and they can by a campaign of education teach the railroad companies in New Jersey that a properly constituted railroad commission will benefit the railroads no less than the people. What, indeed, have the railroads to fear from an honest tribunal expertly constituted to do them justice?

If there is fear on the part of the railroads of New Jersey of a railroad commission, it can only be founded either on their solicitude that the commission will not be a proper one, or else on their desire to do wrongful acts. It behooves the people of the State of New Jersey to forestall and prevent both contingencies, for the uses of a railroad commission to the common weal have been too plainly demonstrated during the course of over 30 years, and in too many States of the Union, to be longer the subject of question or of proper distrust.

Passenger Stations for Small Cities.

In Bulletin 42 of the American Railway Engineering and Maintenance of Way Association, Mr. J. P. Snow, Bridge Engineer of the Boston & Maine, discussing by letter the committee report on Buildings, says:

A prescription for a standard passenger station would be a deplorable outcome of the committee's work. It is seldom that local conditions at different places are precisely similar, and nothing looks worse or is less economical than a building not adapted to its surroundings or the uses for which it is needed. But while our buildings cannot well be standardized, the scheme on which they are designed can be.

The underlying principles governing the design of passenger stations on the Boston & Maine, of the size covered by the report (for towns of from 10,000 to 15,000 people; the station not to be a terminal), are, to furnish a single waiting-room, common to the two sexes; to have a women's dressing-room and two toilet rooms, a baggage room, and generally a telegraph room and express room. No combined freight and passenger stations are built for towns so large as specified. The waiting-room occupies the end of the building next to the street, and the building should be so placed that this will be the sunny portion. The other rooms are bunched at the other end of the building, so arranged that the women's toilet will be entered from the dressing-room, and the men's toilet from a passage, so that the doors will not be adjacent. The entrance to the men's closet is, however, always from the waiting-room—never from the outside of the building. The baggage room has a door opening from the waiting-room for convenience in checking hand baggage. This door is generally made a "Dutch" door, that is, the upper and lower halves swing independently, the lower part having a shelf on the waiting-room side. The water closets are placed close together for economy of plumbing.

In case a telegraph room is not provided separate from the ticket office, the latter is set out in the manner of a bay window, so that the operator can see each way on the track, and an opening separate from the ticket wicket is provided so that trainmen in getting orders will not need to occupy the ticket window. Stations of this size are generally provided with a generous express room, nearly always larger than the baggage room. These buildings are provided with a cellar in which the hot-water heating plant is located, with coal bins, etc.

Such features are standard with us. The walls may be brick or wood, the roofs slate, tile or shingles, and the finish plain or elaborate, as the locality demands. No two are built exactly alike. Some need extra large express rooms, some unusually large baggage rooms, some need ticket rooms to accommodate several clerks, and others only the ticket seller, and a few near the international boundary need a separate waiting-room for immigrants. We do not find a smoking-room essential. Where they are provided, they are but little used. The women's dressing-room may be small, not over 80 or 100 sq. ft. It should contain a wash bowl, a mirror and two chairs. It serves also as a vestibule to the toilet room.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvi.)

American Academy of Railway Surgeons.

The next annual meeting of this organization will be held in Chicago, Ill., Oct. 1 and 2. T. B. Lacey, M. D., Secretary, Council Bluffs, Iowa.

Pacific Northwest Society of Engineers.

This Society held its regular monthly meeting at Seattle, September 5. The meeting was presided over by Mr. R. H. Thomson, President. Written discussions were presented on a paper entitled "The Composition of Paints for Structural Purposes."

The Master Car Painters' Association.

The 34th annual convention of the Master Car and Locomotive Painters' Association was held at the Victoria Hotel, Chicago, Sept. 8-11, inclusive. The present membership of the association is 230.

Papers were presented on the following subjects:

(1) Best method and material for the interior finish of modern passenger cars, including hardwood acid burning treatment, filler, stain, etc.

(2) Heating and ventilating car and locomotive paint shops.

(3) Which is the best method to pursue, touching up or cutting in?

(4) Harmony in color in finishing and furnishing the modern railroad passenger car.

(5) The proper method of painting and maintaining a locomotive engine.

(6) Best method and material for painting and maintaining steel cars.

(7) Is the authority and responsibility of the Master Painter co-equal?

(8) The copper sheathed car.

(9) What is the best material for the shop cleaning of passenger cars preparatory to painting or varnishing?

(10) Report of Committee on Tests.

Abstracts of the papers on painting and maintaining steel cars and painting and maintaining locomotives appear elsewhere in this issue.

PERSONAL.

—Mr. Henry Sanford, Vice-President of the Adams Express Company, died at Bridgeport, Conn., Sept. 6, aged 80 years.

—Mr. Edward McCormick, a Supervisor on the Philadelphia, Baltimore & Washington, died Sept. 10. He was about 30 years old, and was a graduate of Princeton University, class of '95.

—According to apparently well founded rumors Mr. J. M. Hall, President of the New York, New Haven & Hartford, is to retire on or about November 1, and Mr. C. S. Mellen, now President of the Northern Pacific, among others, is prominently mentioned as Mr. Hall's successor.

—Nathan Washburn died in Stafford Springs, Conn., Sept. 15, at the age of 85 years. He was the inventor

*Extracts from a paper by C. A. Coons, Supt. of Transportation, International Railway Co., Buffalo, read before the American Street Railway Association at Saratoga, N. Y., Sept. 4, 1903.

of the well-known Washburn cast-iron car wheel which he designed and patented in 1850. It is the double-plate design still in almost universal use. Mr. Washburn also invented a process for making a wheel with a cast-steel tire and a cast-iron center welded together. He is said to have invented a process for puddling steel by which he made a superior gun iron.

—Mr. S. D. Cushing, who has been appointed Signal and Electrical Engineer of the Southern Railway, was graduated from Lehigh University (Mechanical Engineer) in 1892. For a time he was in the Schenectady shops of the General Electric Company and for several years did general electrical work, construction and operating of central stations. When the Brooklyn & Rockaway Beach Railroad proposed to electrify its road Mr. Cushing went to that company, but this work was not done and he entered the testing and inspection department of the Southern. In 1890, he was made Chief Inspector, and was appointed Electrical Engineer in 1902.

—Mr. A. J. Sovereign, Superintendent of the Minnesota Division of the Northern Pacific, has been in railroad service since 1870, when he began as a fireman on the Michigan Central. In 1873 he was promoted to be engineer of switching engines, and to road engineer in 1874. In the fall of 1877, Mr. Sovereign resigned to go to the Northern Pacific. For fourteen years he served on that road as locomotive engineer; and in 1891 was appointed Assistant Superintendent of the Fergus Falls Branch. The next year he was transferred to Duluth and took charge of the Ashland Division. From this position he was transferred to Staples as Assistant Superintendent of the Second District of the Minnesota Division. He received this latter appointment in 1893 and has continued to discharge these duties until now.

—Mr. W. A. D. Short, Superintendent of Signals of the Cincinnati, New Orleans & Texas Pacific, is a graduate of Harvard, class of '94. In August of that year (1894) he entered the signal department of the Cincinnati, New Orleans & Texas Pacific as a laborer. For a few months he was out of railroad service but soon returned and in 1897 he was made General Foreman of Signals, electric and mechanical, of the C., N. O. & T. P. In July, 1900, he was promoted to be Signal Engineer of the Cincinnati Division. On the first of this month, Mr. Short was appointed Superintendent of Signals in charge of electric and mechanical signals, interlocking and electric light plants for the entire road.

ELECTIONS AND APPOINTMENTS.

Bloomsburg & Sullivan.—W. C. Snyder, hitherto Auditor, has been appointed Superintendent, with headquarters at Bloomsburg, Pa., succeeding D. W. Campbell, resigned.

Choctaw, Oklahoma & Gulf.—F. P. Stewart has been appointed Superintendent, with headquarters at Oklahoma City, Okla. T., succeeding N. C. Phillips, resigned.

Cincinnati, New Orleans & Texas Pacific.—J. L. Driscoll has been appointed Master Mechanic, with headquarters at Chattanooga, Tenn., succeeding J. E. Gould, resigned.

De Queen & Eastern.—T. E. Brown has been appointed General Freight and Passenger Agent, with headquarters at De Queen, Ark., succeeding B. H. Frick.

Detroit & Toledo Shore Line.—S. W. Knapp has been appointed Superintendent. This road is owned jointly by the Grand Trunk and the Toledo, St. Louis & Western.

Erie.—Robert S. Parsons has been appointed Engineer of Maintenance of Way, with headquarters at Jersey City, N. J., succeeding J. R. W. Davis, resigned.

Louisville & Atlantic.—A. C. Hone, hitherto Master Mechanic of the Louisville & Nashville, with headquarters at Louisville, Ky., has been appointed General Manager of the L. & A., with headquarters at Versailles, Ky., succeeding C. M. Browning, who is now Traffic Manager.

Louisville & Nashville.—A. C. Hone, Master Mechanic, with headquarters at Louisville, Ky., has resigned. (See Louisville & Atlantic.)

Long Island.—E. M. Weaver, who for a number of years was with the New York Central & Hudson River, has been appointed Signal Engineer of the L. I., succeeding Mr. Gilmore.

Minneapolis, St. Paul & Sault Ste. Marie.—A. H. Bright has been elected a Director, succeeding the late W. H. Bradley.

Missouri, Kansas & Texas.—R. W. Maguire, hitherto Local Treasurer, has been appointed Comptroller, with headquarters at St. Louis, Mo.

Nashville, Chattanooga & St. Louis.—W. W. Berry has been elected a Director, succeeding E. B. Wesley, resigned.

St. Louis Southwestern.—R. H. Laing has been appointed Assistant General Passenger Agent, with office at St. Louis, Mo.

San Pedro, Los Angeles & Salt Lake.—F. K. Rule has been appointed Treasurer, and H. I. Bettis, hitherto Assistant General Auditor of the Union Pacific, has been appointed Auditor of the S. P., L. A. & S. L., succeeding Mr. Rule. W. H. Leete has been appointed Paymaster.

Seaboard Air Line.—H. C. Macklin, hitherto General Storekeeper of the Norfolk & Western, has been appointed Purchasing Agent of the S. A. L., with headquarters at Portsmouth, Va., succeeding Newton Heston, resigned.

Southern.—S. D. Cushing has been promoted to be Signal and Electrical Engineer, with headquarters at Washington, D. C.

W. M. Deuel has been appointed Assistant Superintendent of the Washington Division, with headquarters at Alexandria, Va.

Southern Pacific.—W. R. Scott, formerly General Superintendent of the Fort Worth & Denver City, has been appointed Superintendent of the Sacramento Division of the S. P., with headquarters at Sacramento, Cal.

Tennessee Central.—O. M. Sewell has been appointed Acting Superintendent, with headquarters at Nashville, Tenn., succeeding W. H. Fox, Superintendent, resigned. Mr. Fox has become Superintendent of the Construction Company. O. M. Laing, Secretary and Purchasing Agent, has been appointed Assistant to the General Manager.

Texas & New Orleans.—A. S. Johnson has been appointed Acting Assistant Superintendent, with headquarters at Houston, Texas, succeeding J. McDonough, Assistant Superintendent, resigned.

Vera Cruz & Pacific.—C. A. Hutchinson has been appointed Superintendent, with headquarters at Tierra Blanca, Mex.

LOCOMOTIVE BUILDING.

The Raleigh & Cape Fear is having one locomotive built at the Baldwin Works.

The Carnegie Steel Company is having one locomotive built at the Pittsburg Works of the American Locomotive Company.

F. M. Hicks, of the Hicks Locomotive & Car Works, has recently sold locomotives to the International Harvester Company, the Dayton & Union R. R., the Cadiz Ry., and the Champion Construction Company. The Louisville & Atlantic has placed an order for one locomotive.

The St. Louis & San Francisco, as stated in our issue of Sept. 11, has filed an equipment trust agreement with Blair & Co., New York, for 100 locomotives. It is reported that orders for these locomotives are to be divided evenly between the American Locomotive Co. and the Baldwin Works.

The Nashville, Chattanooga & St. Louis, as reported in our issue of Sept. 11, has ordered 10 simple consolidation (2-8-0) locomotives from the Baldwin Works, for October, November and December, 1903, delivery. The locomotives will weigh 165,000 lbs., with 148,000 lbs. on drivers; cylinders, 21 in. x 28 in.; diameter of drivers, 55⅝ in.; straight boilers, with a working steam pressure of 200 lbs.; 268 charcoal iron tubes, 2¼ in. in diameter; steel fire-box, 102 in. long and 66 in. wide; grate area 46.75 sq. ft.; tank capacity, 5,000 gal. of water and 10 tons of coal. Special equipment includes Westinghouse brakes, magnesia sectional boiler lagging, Baldwin brake-beams, Tower couplers on tenders, and Leeds reversible couplers on pilots, Simplex injectors, U. S. piston rod and valve rod packings, Coale safety valves, Leach sanding devices, Nathan sight feed lubricators, Railway Steel Spring Co.'s springs, Crosby steam gages and Standard driving and truck wheel tires.

CAR BUILDING.

The New Orleans & Northeastern is in the market for 300 cars.

The Carolina & Northwestern denies that it is in the market for cars.

The National Refining Company, Cleveland, Ohio, is asking bids on 25 tank cars.

The Georgia, Florida & Alabama is having 15 freights built at the Georgia Car & Mfg. Co.

The Maryland & Pennsylvania is having 25 freights built at the South Baltimore Car Works.

The Pullman Company is building 36 coaches at Pullman, and 18 at Buffalo for general service.

The Butte, Anaconda & Pacific has ordered six passenger coaches from the American Car & Foundry Co.

The Chicago, Lake Shore & Eastern has ordered 15 steel coke cars from the American Car & Foundry Co.

The Intercolonial is reported to have ordered 10 vestibule coaches from Rhodes, Curry & Co., Amherst, N. S.

The Chicago & Eastern Illinois has ordered 500 steel gondolas, of 100,000 lbs. capacity, from the Western Steel Car & Foundry Co., and 400 box cars and 100 side-dump cars from the American Car & Foundry Co.

The Mobile & Ohio has ordered 1,000 coal and 300 box cars from the American Car & Foundry Co.; 350 box and 150 stock cars from the Mount Vernon Car & Mfg. Co., and 350 box cars and 20 cabooses from the Georgia Car & Mfg. Co.

The Pennsylvania, as reported in our issue of Sept. 4, has ordered 1,000 class XL box cars of 100,000 lbs. capacity, 300 standard class Gr gondolas of 100,000 lbs. capacity, and 100 standard class Gsa gondolas of 100,000 lbs. capacity from the Pressed Steel Car Company.

F. M. Hicks, of the Hicks Locomotive & Car Works, has the following orders for equipment: Lake Superior & Ishpeming, one passenger coach and one combination car; C. W. Parker Amusement Company, one sleeping car; New York, Ontario & Western, one private car; West Virginia & Southern, one combination passenger and baggage car.

The Atchison, Topeka & Santa Fe, as reported in our issue of Sept. 4, has ordered six baggage cars of 50,000 lbs. capacity from the Pullman Co. The cars will be 60 ft. long and 9 ft. 10½ in. wide. The special equipment includes: M. C. B. axles, National-Hollow brake-beams, Diamond "S" brake-shoes, Westinghouse air-brakes, National couplers, Miner draft rigging, Standard steel platforms and Standard Steel Co.'s wheels.

BRIDGE BUILDING.

ATLANTA, GA.—Bids were wanted Oct. 1, for the Pace's Ferry bridge. It is to have two steel spans each 140 ft. long. E. B. Rosser, Chairman Commissioners Roads and Revenues, Fulton County.

BEAVER FALLS, PA.—The Town Council has been petitioned to build a steel bridge from Eighth avenue to Mt. Washington, at a cost of about $30,000.

BOSTON, MASS.—The Metropolitan Park Commissioners are receiving bids up to Sept. 21 for improvements, including bridge abutments, and concrete steel arch work.

BURNSIDE, KY.—The War Department has approved the plans for a bridge over the Cumberland river at Burnside, and the county has made an appropriation of $15,000 to start the work.

CLEVELAND, OHIO.—The Wheeling & Lake Erie has been notified by the War Department that its bridge over Cuyahoga River is of insufficient width and obstructs navigation. A new bridge with a draw of at least 120 ft. is demanded.

The Newburg & South Shore will build a bridge over Harvard street. The plans recently approved by the Board of Public Service provide for a structure with brick concrete and rock ballast to minimize the noise of trains passing over it.

COLUMBUS, OHIO.—Bids are wanted Oct. 5, by L. E. Jones, Franklin County Auditor, for the substructure of the Chenowith mill bridge, and repairs to a number of other bridges.

CORNING, IOWA.—Several bridges and culverts were washed out by recent floods at this place.

DUBLIN, GA.—The Laurens County Commissioners will replace a number of wooden bridges with steel structures. A contract has been awarded to George H. Crafts, of Atlanta, for a 75-ft. steel bridge with concrete floor.

EAST HARTFORD, CONN.—Bids are wanted by the Board of Selectmen September 22, for the building of the concrete arch bridge over Hockanum River, on Forbes street. Frank Roberts, Selectman.

JEFFERSON, MO.—Bids may soon be asked for a plate girder bridge at this place. J. C. Herring, City Engineer.

KANSAS CITY, KAN.—Bids are wanted Oct. 5, by Frank Holcomb, Wyandotte County Clerk, for the building of a steel bridge over the Kansas river at Twelfth street.

The County Commissioners have awarded the contract at $76,000 for the Central avenue bridge; reports say to the American Bridge Co., New York.

MINNETONKA, MINN.—The Minneapolis & St. Louis, it is said, will build a steel bridge over a channel of St. Albans Bay to replace the present wooden structure.

NEBRASKA CITY, NEB.—The bridge over Table Creek at 20th street which recently gave way will be rebuilt at once.

OCEAN CITY, N. J.—A company is being formed and $125,000 has been subscribed towards the building of a bridge and gravity road between Wildwood and Atlantic City.

PINE BLUFF, ARK.—Local reports state that a new bridge in Benton County will be built over White River, at a cost of about $18,000.

PORTLAND, ME.—The Board of Trade is trying to arrange plans for the building of the Vaughan bridge by the city, to cost about $250,000.

PORTLAND, ORE.—The plans of the Southern Pacific on its extension line in Oregon provide for a steel bridge over the Willamette river at Oswego.

ROCKFORD, ILL.—A bridge may soon be built at Morgan street to cost $60,000. Address E. Main, City Engineer.

ST. JOSEPH, MO.—Bids are wanted Sept. 26, by Buchanan County Court, for new bridge work and repairs to other structures.

SCRANTON, PA.—The County Commissioners will soon ask bids for the building of 14 new bridges at a cost of $8,500.

STERLING, ILL.—Bids are wanted Sept. 25, by the Board of Supervisors and Commissioners of Highways, Sterling Township, Whitestone County, for the building of the substructure and superstructure of a bridge over Rock River between the townships of Sterling and Coloma. The structure will consist of nine spans of 100 ft. each. It is to have a 24-ft. plate girder roadway with tubular piers and concrete abutments.

VERONA, PA.—The Pennsylvania is preparing plans to abolish grade crossings in Verona.

WASHINGTON, D. C.—Permission has been granted to the Pennsylvania to build a railroad bridge over the Anacostia River on the new route from Magruders Station to the new union station on Massachusetts avenue.

WATERLOO, IOWA.—The city and the Cedar Falls Union Milling Company will build a new concrete bridge on Bridge street.

WAUPUN, WIS.—The Chicago, Milwaukee & St. Paul will, it is reported, build a steel bridge at Waupun to replace a wooden structure.

YORK, PA.—The York Bridge Co. has been given the contract to build two new iron county bridges in Cecil County, Md., one at Tyson Mills and the other over Principo Creek.

YOUNGSTOWN, OHIO.—The County Commissioners will, it is reported, build a new bridge over Mosquito Creek and make repairs to the Meander bridge.

Other Structures.

AGUAS CALIENTES, MEXICO.—The general shops of the Mexican Central are being removed from the City of Mexico to this city.

ATLANTA, GA.—Bids are being asked by the Southern for a 600 ft. brick and steel train shed.

The Atlanta Terminal Co., reports say, is asking bids for building new brick and steel freight houses and sheds.

CINCINNATI, OHIO.—The Cincinnati, New Orleans & Texas Pacific is preparing plans for a freight house near Vine and Water streets, also a station at McLean and Western avenues.

ENGLEWOOD, ILL.—The Chicago & Western Indiana, it is reported, has plans ready for freight houses to cost about $70,000 at Englewood.

Hipolito, State of Coahuila, Mexico.—The Mexican Central will build a station, roundhouse, coal chute and a water tank at this place.

Houston, Texas.—The Southern Pacific is having plans prepared for a large hospital.

The Southern Pacific, it is said, will build a seven-story steel office building at the corner of Franklin and Travis streets, Houston.

Louisville, Ky.—The Chicago, Indianapolis & Louisville will, it is reported, build a brick and stone freight house in Louisville.

Minneapolis, Minn.—The Chicago, Rock Island & Pacific will, it is reported, build shops and make other improvements at South Minneapolis.

Mobile, Ala.—A law has been passed which requires the railroads entering Mobile to unite in the building of a passenger station.

Oneonta, N. Y.—The Delaware & Hudson has plans ready, it is said, for an additional roundhouse to cost about $45,000.

Waco, Texas.—The San Antonio & Aransas Pass may build a new passenger depot here.

Washington, D. C.—Bids were opened Sept. 9 at the general offices of the Pennsylvania R. R. in Philadelphia for the new Union station building at Washington, which is to cost $4,000,000. A large number of bids were received and it will be several days before the contract will be let.

Warsaw, N. Y.—The Buffalo, Rochester & Pittsburg, reports state, have plans prepared for a new passenger station.

Waverly, Iowa.—The Chicago Great Western, local reports say, will build a new passenger station.

Wildwood, N. J.—The Mayor is having plans made for the building of a steel pier to cost $75,000 at Wildwood.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Apalachicola Northern.—Surveys are reported completed on the first seven miles of this road from Apalachicola across the Apalachicola river to a point on the northern side of the river. The line will eventually be extended north to Chattahoochee, Fla., 70 miles, where connection will be made with the Seaboard Air Line. H. O. Clement and J. H. Trump, Valdosta, Ga., are said to be interested. (May 8, p. 335.)

Bangor & Aroostook.—An officer writes that preliminary surveys have been made for an extension from Squa Pan, Me., north to Frenchville, 50 miles.

Canadian Northern.—Press reports state that a contract has been let to A. Kennedy, Swan River, Man., for grading 29 miles of an extension of the Hartney branch from Hartney in a northwesterly direction. (July 17, p. 534.)

Chesterfield & Lancaster.—Surveys are reported in progress on an extension from Ruby, S. C., southwest to Plains, 15 miles. The road at present runs between Cheran, S. C., and Ruby, 23 miles, and connects with the Seaboard Air Line and the Atlantic Coast Line at Cheraw. W. F. Stevens, Cheraw, is Chief Engineer.

Chicago, Milwaukee & St. Paul.—Work is reported begun on a branch line from Preston, Minn., to Isinours, 4½ miles. Foley Bros., St. Paul, Minn., have the contract for grading.

Choctaw, Oklahoma & Gulf.—It has been officially announced that the W. R. Stubbs Contracting Co., which has the contract for building the extension from Amarillo, Texas, west to Las Vegas and Tecumcari, N. Mex., will resume work very shortly. (Aug. 21, p. 610.)

Cincinnati, Findlay & Fort Wayne.—This company has been incorporated in Ohio. It proposes to build or acquire a steam railroad from Findlay, Ohio, to Fort Wayne, Ind., 75 miles. Rush Taggart, C. W. McKnight, J. B. Childs and F. M. Carter are incorporators.

Cleveland Belt.—This company has been incorporated in Ohio to build and operate a steam railroad around the city of Cleveland. The line lies wholly in Cuyahoga County. J. E. McGettigan, J. H. Abbott, G. E. Darnell and Lewis Wallace are incorporators.

Coal & Coke.—Bids are now being asked for doing grading and masonry work on ten miles of track from the mouth of Copen Run near Burnsville, W. Va., to a point in Perkins Fork of Cedar Creek, including one 1,100 ft. tunnel. Plans and profiles may be seen at the general office at Elkins, W. Va., or at the office of A. A. Chapman, Weston, W. Va. W. H. Bower is General Manager, Elkins, W. Va.

Coast Belt Line.—Press reports state that a contract has been let for building this line from Sinton, Texas, northeast to Galveston, 198 miles, with a branch line from Galveston to Houston. R. L. Clark, Port Lavaca, Texas, is President.

Coatzacoalcos, Yucatan & Guatemala.—It is reported that work has been begun on this road. The proposed route is from Coatzacoalcos through the States of Tabasco and Campeche to Merida, in the State of Yucatan, 600 miles. It will pass through a country as yet without railroad facilities. P. O. Saunders, Mexico City, is promoting the scheme.

Columbus, Pensacola & Memphis.—A charter has been granted this company in Mississippi, to build a railroad from Columbus, Miss., north to Aberdeen, 25 miles. Connection will be made with the Illinois Central at Aberdeen. Newman Cayce is President; E. C. Chapman, Vice-President, and W. B. Walker, General Counsel, all of Aberdeen, Miss. (Aug. 21, p. 610.)

Corydon, Moravia & Kansas City.—Press reports state that a company is about to be organized to build a railroad from Allerton, Iowa, northeast via Corydon and Moravia to Ottumwa, 60 miles.

Denton, Decatur & Western and North Texas & Louisiana.—An officer writes that these companies have been organized in Texas and Louisiana, to build a railroad from McKinney, Texas, to Roswell, N. Mex., a total distance of 500 miles, and from McKinney to Mansfield, La. Contracts for grading will shortly be let. W. H. Sisson, 606 Benoist Building, St. Louis, Mo., is President; J. P. McCarthy, Lufkin, Texas, is Chief Engineer. (Sept. 4, p. 622.)

Hudson & Manhattan.—Press reports state that preliminary surveys are now being made by this company for its proposed tunnel from Cortlandt and Fulton streets to a point in Jersey City. The work is being carried on by Jacobs & Davies, 128 Broadway. (March 27, p. 240.)

Iowa City, Kalona & Washington (Electric).—Articles of incorporation have been filed by this company in Iowa. It is proposed to build an electric railroad from Iowa City via Kalona to Washington, 24 miles. Geo. Rodman, Washington, Iowa, is President; W. P. Coast, Vice-President; W. J. Welch, Iowa City, Secretary.

Jennings & Northern.—Contract is reported let to Knox, George & Co., of New Orleans, for building this line from Jennings, La., north to oil fields. According to the terms of the contract, work must be begun at once. E. F. Rowson, Jennings, La., is President. (April 10, p. 274.)

Lincoln, San Francisco & Eastern.—Preliminary surveys have been finished for this road from Vernon Landing, Cal., east through Lincoln and Spenceville to Grass Valley. The road will connect with boats plying between Sacramento and San Francisco. C. L. Wilson, Nevada City, Cal., is President. (Sept. 4, p. 642.)

Little Rock & Monroe.—Rights of way have been secured and location surveys finished for the first 20 miles of this road from Lapile, Ark., south via Ouachita to Monroe, La., 50 miles. A contract for grading has been let to T. M. Dodson & Son, El Dorado, Ark. The work is light with a maximum grade of .6 per cent., and a maximum curvature of 3 deg. C. D. Johnson, Equitable Building, St. Louis, Mo., is President. (July 24, p. 548.)

Louisiana Railway & Navigation Co.—This company, which was formerly the Shreveport & Red River Valley, has been granted an entrance into New Orleans, by action of the city council. The main line will probably be extended from its present terminus at Mansura, La., to Baton Rouge, and New Orleans. W. E. Hawley, Shreveport, La., is Chief Engineer. (May 22, p. 368.)

McKeesport & Clairton Connecting.—Rights of way are now being secured by this company for a railroad from a point in the city of McKeesport, to a point near Clairton, Allegheny County, Pa., five miles. Connection will be made with the Baltimore & Ohio at McKeesport; the Pittsburg & Lake Erie at Portvue, and the Chesapeake, Virginia & Charleston division of the Pennsylvania at Clairton. J. D. O'Neil, McKeesport, is President. (June 26, p. 478.)

Manila Street Railway.—The Philippine Commission has granted this company a franchise, with power to build two branches through the agricultural districts of Malolos Valley. (March 27, p. 240.)

Marquette, Spring Valley & Northwestern.—Work is reported in progress on this line from Spring Valley, Ill., southwest to Marquette, five miles. The General Construction Company, Davenport, Iowa, has the contract. It is said that the road will be in operation by Dec. 1. J. S. Wylie, Davenport, Iowa, is President. (See Construction Supplement.)

Nichols Short Line.—The route of this proposed railroad is from Belva, W. Va., to Laurel Creek, six miles. Contracts for grading will be let about Sept. 20. The road will be used as a feeder for the Gauley branch of the Chesapeake & Ohio. C. C. Sharp, Gauley Bridge, W. Va., is Chief Engineer. (Aug. 7, p. 580.)

Northampton & Bath.—Grading is reported finished on this new line from the works of the Atlas Portland Cement Co. at Northampton, Pa., to Bath, six miles. J. R. Maxwell, New York, is President.

Oregon R. R. & Navigation.—Press reports state that this company will build an extension from Moscow east to Troy, Idaho, 10 miles. Rights of way are now being secured. The new line will parallel the Northern Pacific between these points.

Ottawa, Marseilles & Streator.—Articles of incorporation have been filed by this company in Illinois to build from Ottawa east to Marseilles and thence south to Streator, 25 miles, all in La Salle County. F. B. Davidson and Chas. H. Adams, Marseilles, Ill., and Clarence Griggs, Ottawa, Ill., are incorporators.

Pennsylvania.—Surveys are now being made for a branch from Kennerdell, Venango County, Pa., southwest to Grove City, Mercer County, 18 miles. Connection will be made with the Wolf Creek branch of the Pennsylvania at Grove City.

Pere Marquette.—It is reported that this company will extend its line from Clare, Mich., northwest a distance of 20 miles.

St. Louis & San Francisco.—Track laying has been begun on the cut-off from Evadale, Ark., to Big Creek, 16 miles, and it is stated that the entire line will be open for traffic by Nov. 1. J. B. Hanna, Springfield, Mo., is the engineer in charge of the work. (July 24, p. 548.)

South Carolina Roads.—The newspapers say that a railroad will shortly be built from Green Sea south to Howard, S. C., 10 miles, where connection will be made with the Atlantic Coast Line. Derham & Co., Green Sea, S. C., are said to be behind the project.

Southern.—It is stated that this company is about to build a second track from Charlotte, N. C., northwest to Norfolk, 50 miles.

Syracuse, Skaneateles & Moravia (Electric).—The contract has been let to the Bureau of Expert Investigation and Construction, 35 Nassau street, New York, for building this railroad from Moravia, N. Y., north to Skaneateles and thence northeast to Syracuse, 40 miles. Connection will be made with the Lehigh Valley at Moravia, and with the New York Central at Syracuse. Location surveys will be made at once, and grading will be begun as soon as the surveys are completed. W. T. Parker, Moravia, N. Y., is President.

Taylorsville, Wilkesboro & Newton.—The newspapers say that this company is to be organized in North Carolina to build a steam or electric railroad from Wilkesboro south through Taylorsville to Newton, 30 miles. Connection will be made with the Southern at all three towns. W. C. Flimstay, Newton; F. C. Henderson, Wilkesboro, N. C., and others are said to be interested.

Virginia R. R.—An officer writes that although rights of way have been secured, and surveys finished, the contracts for grading this line will not be let until the spring. The proposed route is from Rosney, Va., to Danville, 110 miles. Wm. Ingles, Radford, Va., is Chief Engineer; K. T. Crawley, Farmville, Va., is President. (July 3, p. 502.)

Wyoming Roads.—It is reported that the Pennsylvania Oil & Gas Company will build a railroad from Casper, Wyo., north to the Salt Creek oil fields, in Natrona County, a distance of 60 miles. Connection will be made with the Fremont, Elkhorn & Missouri Valley at Casper.

GENERAL RAILROAD NEWS.

Atlantic & North Carolina.—At a recent meeting of the directors of this company, it was voted not to accept the offer which was recently made by a syndicate to take a 50-year lease of this road and pay as rental a sum equal to 2 per cent. of the capital stock. The State of North Carolina is two-thirds owner of this road.

Aylmer & North Shore Electric.—A mortgage for $1,250,000 has been made with the Guardian Trust Company of New York as trustee. The road operates between London, Ont., and the town of Aylmer, along the north shore of Lake Ontario. The mortgage and bonds bear the date of April 29, 1903, and are for 20 years.

Canadian Northern.—With regard to the proposed trans-continental line of this company, the *Toronto Globe* publishes the following interview with Mr. Mackenzie, President of the Canadian Northern: "It is hardly correct to say that we have abandoned our proposed trans-continental line, but it does look as though we would have to postpone the construction of a through line from the Atlantic to the Pacific for the time being. The trans-continental line does not depend so much upon us, as upon the Government and the country. The question is whether the country will aid a third trans-continental line. With regard to the extension of our main line from Grandview to Edmonton, and the branch to Prince Albert, we expect to have 300 miles of the line to Edmonton completed by the end of 1903. At Port Arthur our elevator accommodation is being doubled, which will enable us to care for more than 7,000,000 bushels of grain."

Chicago, Milwaukee & St. Paul.—Gross earnings of this company for the fiscal year ending June 30 were $47,662,738, an increase of $2,049,613. Net earnings were $16,574,594, an increase of $648,334.

East Berlin.—The Berlin Branch R. R., running from Berlin Junction to East Berlin, Pa., seven miles, has been reorganized and the following officers have been elected: W. A. Hines, President; W. G. Leas, Vice-President, and J. D. Keith, Treasurer. The headquarters of the company are at Gettysburg, Pa.

Minneapolis, St. Paul & Sault Ste. Marie.—Articles of incorporation have been filed to consolidate the several companies comprising the "Soo" system. The consolidation includes the Minneapolis, St. Paul & Sault Ste. Marie, the Minneapolis & St. Croix, the Minneapolis & Pacific, and the Aberdeen, Bismarck & Northwestern. The consolidated company will have a capital of $20,000,000. The new stock will be exchanged for the stock of the old companies as follows: The Minneapolis, St. Paul & Sault Ste. Marie stock is exchanged dollar for dollar in kind, and the stock of the others on the basis of three of their shares for one share of preferred, and two shares of common in the new company.

Missouri, Kansas & Texas.—Gross earnings for the fiscal year ending June 30, 1903, were $17,208,193, an increase of $816,793. Operating expenses were $12,123,131, an increase of $575,925, leaving an increase in net earnings of $240,868. During the year 158 miles of new track were acquired by this company which now operates a total mileage of 2,601.

National of Mexico.—This company has secured a loan of $8,300,000 through Speyer & Company, New York, to pay for the recently acquired control of the Interoceanic Railway of Mexico. The notes will bear 5 per cent. interest and will run for two years, from Oct. 1, 1903, subject to redemption at par on 60 days' notice. It is reported that the greater part of the notes have already been sold in Europe.

New York & Pittsburg Central.—A circular has recently been issued stating that the above company has absorbed all the property and franchises of the Pittsburg, Johnstown, Ebensburg & Eastern. This road runs from Phillipsburg, Pa., to Fernwood, 20 miles, with a branch from Altoona to Dougherty, 15 miles. J. G. Luke is President of the new company.

Perry County.—This railroad, which runs from Duncannon, Pa., to Landisburg, 23 miles, was sold at auction on Sept. 14, to satisfy a mortgage of $147,000 dated July 1, 1892. The name of the purchaser is not stated, but it is reported that the road was bought by interests connected with the Pennsylvania. Chas. H. Smiley, New Bloomfield, Pa., is President of the road.

Pittsburg, Johnstown, Ebensburg & Eastern.—See New York & Pittsburg Central above.

Richmond, Fredericksburg & Potomac.—See Richmond-Washington Company below.

Richmond-Washington Company.—This company, which controls the Richmond, Fredericksburg & Potomac, and the Washington Southern, has made a collateral trust mortgage with the New York Security & Trust Company as trustee, to secure $11,000,000 of 4 per cent. 40-year gold bonds. These bonds, of which $6,000,000 have already been sold to insurance companies and other large concerns in New York city, are guaranteed jointly, both principal and interest, by the six roads which own the R.-W. The proceeds will be used for laying second track, reducing grades and other improvements.

Seaboard Air Line.—The gross earnings for this company for the fiscal year ending June 30, 1903, were $12,706,527, an increase of $1,126,712 over the same period in 1902. Operating expenses increased $1,174,558, leaving a decrease in net earnings of $47,846. This large increase in operating expenses is due to the higher cost of materials and labor, and to the large number of extensive improvements which were carried out during the past year.

South Pennsylvania.—A bill has been filed against this company by the Union Trust Company of New York, to foreclose the mortgage which the trust company holds against the railroad. The bill states that the railroad has failed to pay the interest on bonds amounting to $20,000,000, which were issued in 1885, and calls for the foreclosure of the mortgage in order to redeem this indebtedness.

Wabash.—Gross earnings for this company for the year ending June 30, 1903, were $21,140,829, an increase of $2,087,336. Operating expenses increased $1,968,226, leaving an increase in net earnings of $119,110.